Sontay® SonNet Radio Sensor System

User Manual

Version 4.2

August 2015

Audience

This manual is intended for specifiers, users and installers of the Sontay® SonNet radio sensor system.

Content

This manual provides a complete reference for the Sontay® SonNet radio sensor system.

Related Documents

The Sontay® SonNet radio sensor system Site Survey Kit Quick Start Guide
The Sontay® SonNet radio sensor system Site Survey Kit Manual
The Sontay® SonNet radio sensor system Quick Start Guide
The Sontay® SonNet radio sensor system product datasheets

Table of Contents:

Overview 5
Environmental 5
Battery Fitting and Replacement 5
Disposal of Batteries 5
Devices Types 6
Battery Powered Nodes 6
24V Powered Routers 8
230Vac Powered Routers 10
The System Receiver 11
The RF-IOM 12
The Radio Network 14
Network Planning Considerations 15
The Radio System 17
Security 17
How the Self-Healing Tree Network is Formed 17
Propagation Of Radio Signals in Buildings 18
Extension Aerials 19
FAQs 20
Configuration & Monitoring Software 22
Important – Disabling Driver Signing Verification 22
Windows 7 64-bit 22
Windows 8 23
Windows 8.1 23
Windows 10 23
Installing CMS 24
Starting CMS 27
Importing a Saved Layout 28
The CMS Desktop Environment 29
Logging On as an Administrator 30
Changing the Administrator Password 30
Auto Configuration Mode 31
Listing Devices 32
Changing Device Labels 33
Creating Analogue Output Channel Mapping 34
Viewing Device Properties 35
Changing Device Configurations 37
Configurable Parameters 37
RF-IOM Configuration 39
RF-IOM Status Tab 39
Changing the input configuration 40
Changing the output configuration 41
Manually Authorising a New Node 42
Removing a Node from the Network 42
Using the Graphical Map Display 43
Setting the Map Display Background Image 43
Adding Devices to the Map Display 44
Icon Plan 44
Device Status 45
Link Status 45
Auto Updating 46

Manual Refreshing Of Data....46
Communications Log....47
Changing Display Units....47
Configuration Log....48
Using CMS To Document A Wireless Network....49
Saving and Opening Layouts....49
Receiver Print Preview....50
SonNet-Tridium JACE Driver Action Menus....51
Network Action Menu....51
Receiver Action Menu....51
Router Action Menu....52
RF-IOM Action Menu....53
Sensor Action Menu....54
Managing a Tridium JACE SonNet Wireless Network....56
Requirements....56
Installing the SonNet Driver to a Tridium JACE....56
Adding a SonNet Network....57
Prerequisites....57
Commissioning a SonNet Network....58
Commissioning an Existing Network....58
Commissioning a New Network....59
Configuring Network Devices....60
Device Prefixes....60
Receiver....60
Routers....61
RF-IOMs....62
Writing Output RF-IOM Values....63
RF-IOM Fallback Values....63
End Devices (EDs)....65
The VFC Activation Count Point....66
Commissioning Multiple Networks on the Same Site....67
Pre-commission each network away from site....67
Commission each network individually on site....67
Commissioning a SonNet System: A Step-By-Step Guide....68
Best Practise Points....70
Trouble-Shooter's Guide....71
Estimating Network Coverage in the Absence of a Site Survey....77
Attenuation Properties of Common Building Materials....78
Strategy Tips....79
Alarms....83

Overview

The wireless nodes are based on direct-sequence spread spectrum communication in the 2.4 - 2.5GHz band, compliant with IEEE 802.15.4-2006.

All nodes have a unique MAC address, equivalent to a unique serial number.

All nodes have a PCB-mounted on/off switch or jumper.

All nodes retain their configuration properties across a power failure.

Environmental

- Storage temperature range of -10 to +80°C
- Storage relative humidity range of 0 to 90% (non-condensing).
- Ambient (operating) temperature range of -10°C to +50°C
- Ambient (operating) relative humidity range of 0 to 90%, (non-condensing).

Battery Fitting and Replacement

When a battery is installed, or when it is replaced, observing the correct polarity is very important. Fitting the battery incorrectly may result in permanent damage to the device.

Recommended batteries are 3.6Vdc 2.4Ah AA size Lithium-Thionyl Chloride types for space housing sensors, or 3.6Vdc 2.1Ah 2/3 A size Lithium-Thionyl Chloride types for plant housing sensors, and are **not rechargeable**.

This type of battery should be stored in a clean, cool (not exceeding +30°C), dry and ventilated area.

Disposal of Batteries - Warning! Fire, Explosion and Burn Hazard

Do not short-circuit, crush, disassemble, heat above 100°C (212°F), incinerate, or expose the battery contents to water. Do not solder directly to the cell.

NB - All batteries *must* be disposed of in accordance with EC Directive 2006/66/EC, amended by EU Directive 2008/12/EC.

Devices Types

Battery Powered Nodes

Battery powered sensor nodes are used in conjunction with the Sontay® **RF-RX20**, **RF-RX40**, **RF-RXS** and **RF-RXS-N** receiver units, and if required (depending on installation topography), Sontay® **RF-RR** series of routers. Data is transmitted back to the receiver at configurable time intervals, or on a configurable change in measured value. Each sensor retains these configurations if the battery becomes discharged or requires replacement. The sensors automatically find the best path back to the receiver, which may be directly to the receiver or *via* "parent" routers.

To power a battery powered node, jumper J400 must be fitted. To switch off, remove J400.

Battery powered nodes are available in 4 formats:

- Space mounting temperature, with setpoint, momentary switch, fan speed, VFC input and CO_2 options
    - **NB -** setpoint, momentary switch and fan speed options are not available with the CO_2 option
- Space mounting RH&T, with setpoint, momentary switch, fan speed, VFC input and CO_2 options
    - **NB -** setpoint, momentary switch and fan speed options are not available with the CO_2 option
- Plant mounting temperature
- Plant mounting RH&T

Space Mounting Specification:

Radio Output:
- Frequency 2.4GHz
- 16 channels, automatically selected, direct-sequence spread spectrum
- Compliance IEEE 802.15.4-2006

Aerial Characteristics:
- Gain 1.2dBi
- VSWR 1.5:1

Data Encryption: AES 128
Power Output: 0dBm (1mW @ 50Ω)
Accuracy:
- Temperature ±0.3°C
- Optional RH ±3% RH

Battery Type: 3.6V AA 2.4Ah Li-$SOCl_2$, non-rechargeable
Battery Life: >3 years (depending on configuration)
Housing:
Material: ABS (flame retardant)
Dimensions: 115 x 85 x 28mm
Environmental:
Operating:
- Temperature: -10°C to +50°C
- RH: 0 to 90%, non-condensing

Storage:
- Temperature: -10°C to +80°C
- RH: 0 to 90%, non-condensing

Country of origin: UK

Refer to product datasheets for installation instructions.

Plant Mounting Specification:

Radio Output:
- Frequency 2.4GHz
- 16 channels, automatically selected, direct-sequence spread spectrum
- Compliance IEEE 802.15.4-2006

Aerial Characteristics:
- Gain 2.0dBi
- VSWR 2:1

Data Encryption: AES 128
Power Output: 0dBm (1mW @ 50Ω)
Accuracy:
- Temperature ±0.3°C
- Optional RH ±3% RH

Battery Type: 3.6V AA 2.4Ah Li-$SOCl_2$, non-rechargeable
Battery Life: >3 years (depending on configuration)
Housing:
Material: ABS (flame retardant type VO)
Dimensions: 115 x 85 x 28mm
Mounting: Holes 4mm spaced 85mm apart
Protection: IP65
Environmental:
Operating:
- Temperature: -10°C to +50°C
- RH: 0 to 90%, non-condensing

Storage:
- Temperature: -10°C to +80°C
- RH: 0 to 90%, non-condensing

Country of origin: UK

Temperature Sensor Types:
- Duct
- Outside air
- Outside air with solar radiation shield
- Immersion
- Strap-on
- Flying lead

Refer to product datasheets for installation instructions.

24V Powered Routers

24V powered routers are used in conjunction with the Sontay® **RF-RX20**, **RF-RX40**, **RF-RXS** and **RF-RXS-N** receiver units, **RF-IOM** IO modules and **RF-RS** series of battery powered radio sensors, and are used to route signals from battery powered nodes and other routers to the receiver module, where the signal strength of a direct path is not sufficient for reliable communications. **NB** Each router can support a maximum of 16 "children", which can consist of a maximum of 8 battery powered nodes and 8 routers, ***or*** up to 16 routers ***if*** there are no battery powered nodes. Consideration should be given on network planning for redundancy in case of router failure or damage.

Data is transmitted back to the receiver at configurable time intervals, or on a configurable change in measured value. Each sensor retains these configurations if the battery becomes discharged or requires replacement. Routers automatically find the best path back to the receiver, which may be directly to the receiver or *via* other "parent" routers.

To power a router, jumper J200 must be fitted. To switch off, remove J200.

24V powered nodes are available in 5 formats:

- Space mounting temperature, with setpoint, momentary switch, fan speed, VFC input, PIR and CO_2 options
    - **NB -** setpoint, momentary switch and fan speed options are not available with the CO_2 option
- Space mounting RH&T, with setpoint, momentary switch, fan speed, VFC input, PIR and CO_2 options
    - **NB -** setpoint, momentary switch and fan speed options are not available with the CO_2 option
- Plant mounting with no sensor functions
- Plant mounting temperature
- Plant mounting RH&T

Space Mounting Specification:

Radio Output:
- Frequency 2.4GHz
- 16 channels, automatically selected
- Direct-sequence spread spectrum
- Compliance IEEE 802.15.4-2006

Aerial Characteristics:
- Gain 1.2dBi
- VSWR 1.5:1

Data Encryption: AES 128
Power Output: +10dBm (10mW @ 50Ω)
Accuracy:
- Temperature ±0.3°C
- Optional RH ±3% RH

Power Supply: 24Vac/dc
Housing:
Material: ABS (flame retardant)
Dimensions: 115 x 85 x 28mm
Environmental:
Operating:
- Temperature: -10°C to +50°C
- RH: 0 to 90%, non-condensing

Storage:
- Temperature: -10°C to +80°C
- RH: 0 to 90%, non-condensing

Country of origin: UK

Refer to product datasheets for installation instructions.

Plant Mounting Specification:

Radio Output:
- Frequency 2.4GHz
- 16 channels, automatically selected, direct-sequence spread spectrum
- Compliance IEEE 802.15.4-2006

Aerial Characteristics:
- Gain 2.0dBi
- VSWR 2:1

Data Encryption: AES 128
Power Output: +10dBm (10mW @ 50Ω)
Accuracy:
- Temperature ±0.3°C
- Optional RH ±3% RH

Power Supply: 24Vac/dc
Housing:
Material: ABS (flame retardant type VO)
Dimensions: 115 x 85 x 28mm
Mounting: Holes 4mm spaced 85mm apart
Protection: IP65
Environmental:
Operating:
- Temperature: -10°C to +50°C
- RH: 0 to 90%, non-condensing

Storage:
- Temperature: -10°C to +80°C
- RH: 0 to 90%, non-condensing

Country of origin: UK

Temperature Sensor Types:
- Duct
- Outside air
- Outside air with solar radiation shield
- Immersion
- Strap-on
- Flying lead

Refer to product datasheets for installation instructions.

230Vac Powered Routers

The 230Vac powered RF-RR-MPR routers can be used in conjunction with the Sontay® **RF-RX20**, **RF-RX40**, **RF-RXS** and **RF-RXS-N** receiver units, **RF-IOM** IO modules, 24V powered **RF-RR** routers and **RF-RS** series of battery powered radio sensors, and are used to route signals from battery powered nodes and other routers to the receiver module, where the signal strength of a direct path is not sufficient for reliable communications. **NB** Each router can support a maximum of 16 "children", which can consist of a maximum of 8 battery powered nodes and 8 routers, ***or*** up to 16 routers ***if*** there are no battery powered nodes. Consideration should be given on network planning for redundancy in case of router failure or damage.

NB - the **RF-RR-MPR** 230Vac has no sensor capability.

Specification:

Radio Output:	
Frequency	2.4GHz
16 channels, automatically selected	
Direct-sequence spread spectrum	
Compliance	IEEE 802.15.4-2006
Aerial Characteristics:	
Gain	2.0dBi
VSWR	<2:1
Data Encryption:	AES 128
Power Output:	+10dBm (10mW @ 50Ω)
Power Supply:	85 – 240Vac @ 50/60 Hz
Housing:	
Material:	ABS (flame retardant)
Dimensions:	116 x 106 x 52mm
Environmental:	
Ambient:	
Temperature:	-30°C to +70°C
RH:	0 to 90%, non-condensing
Protection:	IP30

The System Receiver

The SonNet® receiver collects data from all other devices on the radio network, including measurements from sensors, link quality for all links formed in the network, battery levels for all battery powered devices, hours run for all devices and the current status of all devices. **NB** Each receiver can support a maximum of 16 "children", which can consist of a maximum of 12 battery powered nodes and 4 routers, ***or*** up to 16 routers ***if*** there are no battery powered nodes.

A USB socket is provided for connection to a PC or laptop running the Sontay SonNet CMS software (not **RF-RXS-N**).

NB *- If the USB port of an **RF-RXS** receiver is connected, the 9-way serial port is temporarily disabled until the USB port id disconnected again.*

Receivers are available in 4 formats:

- **RF-RX20** - 20 x 0-10Vdc analogue outputs
- **RF-RX40** - 40 x 0-10Vdc analogue outputs
- **RF-RXS** - Serial output and USB port for use with CMS
- **RF-RXS-N** - Option card for Tridium JACE controllers

Receiver Specification:

Radio Output:		
	Frequency	2.4GHz
	16 channels, automatically selected	
	Direct-sequence spread spectrum	
	Compliance	IEEE 802.15.4-2006
Aerial Characteristics:		
	Gain	2.0dBi
	VSWR	2:1
Data Encryption:		AES 128
Power Output:		+10dBm (10mW @ 50Ω)
Analogue Outputs:		
	RF-RX20	20 x 0-10Vdc analogue outputs @10mA max. each
	RF-RX40	40 x 0-10Vdc analogue outputs @10mA max. each
Analogue Output ranges:		
	Temperature	-10°C to +70°C
	RH	0% to +100%
	Setpoint	0% to +100%
	Switch	0Vdc = OFF, 10Vdc = ON
Power Supply:		24Vac/dc
Environmental:		
Operating:		
	Temperature:	-10°C to +50°C
	RH:	0 to 90%, non-condensing
Storage:		
	Temperature:	-10°C to +80°C
	RH:	0 to 90%, non-condensing
Country of origin:		UK

Refer to product datasheets for installation instructions.

The RF-IOM

The **RF-IOM** has no "intelligence", but merely acts as local I/O with connectivity to typical HVAC equipment such as fan coil units (FCUs) and variable air volume (VAV) boxes. The **RF-IOM** reads its digital and analogue inputs and transmits the values wirelessly to a BMS controller *via* either a SonNet V2 serial receiver or a SonNet option card receiver. The **RF-IOM** receives its output values wirelessly from a BMS controller *via* either a SonNet V2 serial receiver or a SonNet option card receiver.

Additionally, the **RF-IOM** has full router functionality.

Typically, a simple system will consist of;

- Battery powered EDs
- Powered routers (if required)
- SonNet V2 serial receiver or a SonNet option card receiver
- RF-IOMs

The EDs (and routers, where applicable) operate in the normal way. Data from the receiver is made available to the controller via a serial link. The SonNet data points are then used by the controller as part of a control strategy, which will typically calculate heating and cooling demands, damper positions etc. These calculated control values will then be passed back to the receiver via the serial link and passed from the receiver over the wireless network to the **RF-IOM**.
The **RF-IOM** *outputs* are defined as points in the JACE so that their values can be set by the control strategy via the receiver. Note that the **RF-IOM** cannot be used with the **RF-RX20** or **RF-RX40** receivers.

RF-IOM Specification:

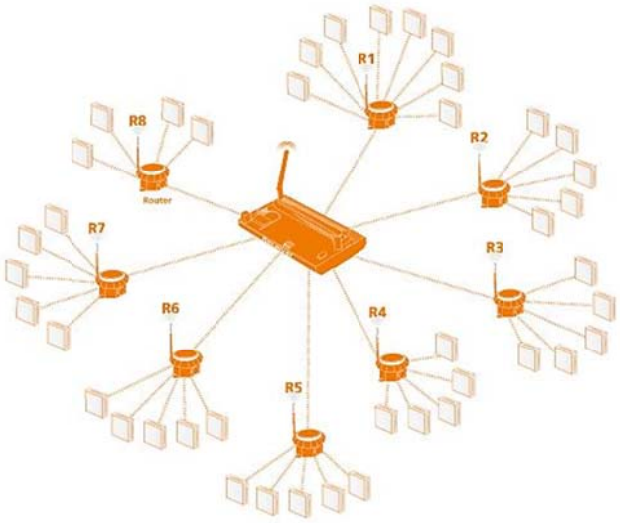
Radio Output:
Frequency 2.4GHz
16 channels, automatically selected
Direct-sequence spread spectrum
Compliance IEEE 802.15.4-2006
Aerial Characteristics:
Gain 2.0dBi
VSWR 2:1
Data Encryption: AES 128
Power Output: +10dBm (10mW @ 50Ω)
Power Supply: 24Vac/dc
Inputs:
4 x universal inputs;
4-20mA (loop or externally powered), into 750Ω maximum impedance
0-10Vdc, into 4k7Ω minimum impedance
Resistive, 1.5kΩ min to 60kΩ max
Digital, VFC
Outputs: 4 x 0-10Vdc linear, @ 20mA per output
LED Indication:
Network
Data
Digital input
Housing: DIN Rail H86mm x W58mm x L104mm (excluding aerial)
Environmental:
Operating:
Temperature: -10°C to +50°C
RH: 0 to 90%, non-condensing

Storage:	
Temperature:	-10°C to +80°C
RH:	0 to 90%, non-condensing
Country of origin:	UK

The Radio Network

A Sontay® SonNet radio system is comprised of a receiver, battery powered sensors, RF-IOMs and permanently powered routers.

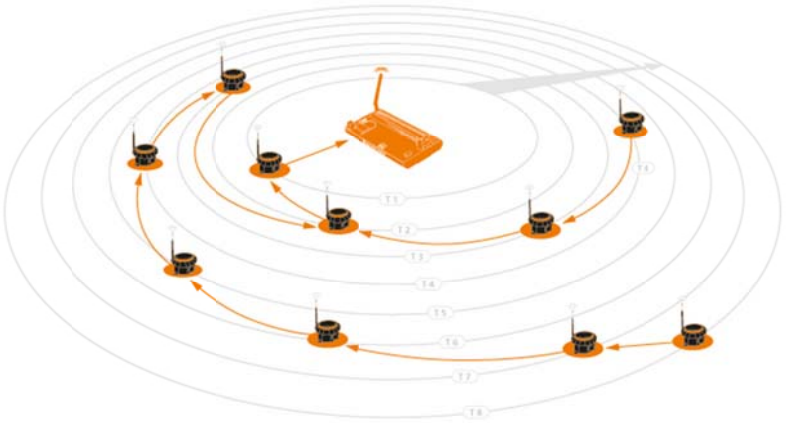
Routers, though permanently powered, can also have sensing elements, accomplishing both router and sensors functions. Routers, RF-IOMs and sensors can either communicate directly with the receiver or *via* other routers. RF-IOMs and routers are required to be permanently powered as they need to stay "awake" at all times to allow signals from "child" nodes to be instantly forwarded to their "parent" nodes. Battery powered sensors only "wake" for very short periods to send data.



In the schematic above, routers **R2 to R7** have 5 children each, all battery powered sensors. Their parent is the receiver. Router **R1** has 6 children and **R8** has 4 children, giving a total number of network devices of 50, including the receiver.

The receiver can support a **maximum** of 16 directly connected "child" devices, of which only 12 can be battery powered nodes, plus up to 4 routers.

RF-IOMs and routers can support a **maximum** of 16 directly connected "child" devices, of which only 8 can be battery powered nodes, plus up to 8 routers.



There can be a maximum depth of 8 layers of routers in a network and a maximum of 150 nodes per network with the **RF-RX** series of receivers.

Note that battery powered devices can only route their signals to the receiver directly or through RF-IOMs and routers, and **not through other battery powered devices**.

When planning a SonNet radio network, it is recommended that the Sontay® SonNet Site Survey Kit be used. This easy-to-use package allows installers to test signal strengths between locations required for battery powered sensors and the receiver prior to installing the full system. It can also identify whether routers are needed to ensure reliable communications between all devices on the network back to the receiver. This removes any guesswork from planning a system and allows the installer to order exactly and only the devices required.

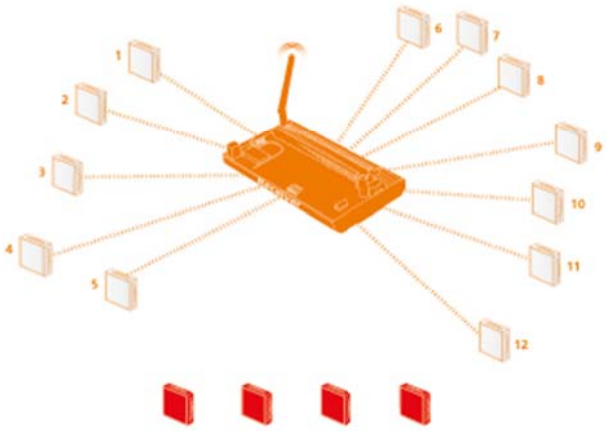
See the Sontay® SonNet radio sensor system Site Survey Kit Quick Start Guide and The Sontay® SonNet radio sensor system Site Survey Kit Manual for full details.

Network Planning Considerations

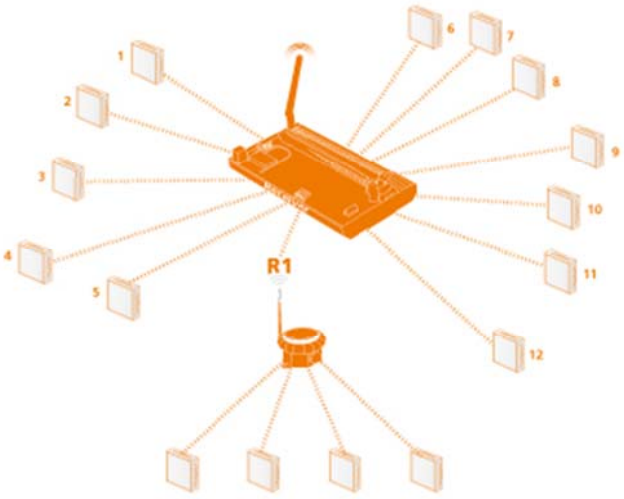
When planning a SonNet radio system, it is always worth considering the placement of routers, and should be capable of handling the consequences of a router failing or being damaged.

Example:

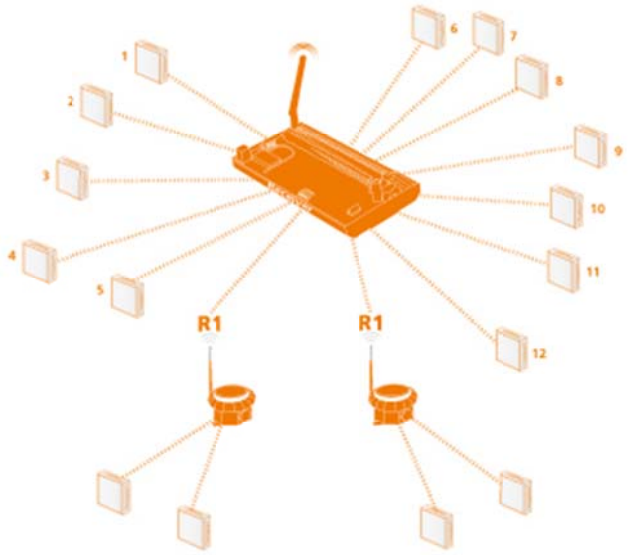
Consider a network with a requirement for 16 EDs:



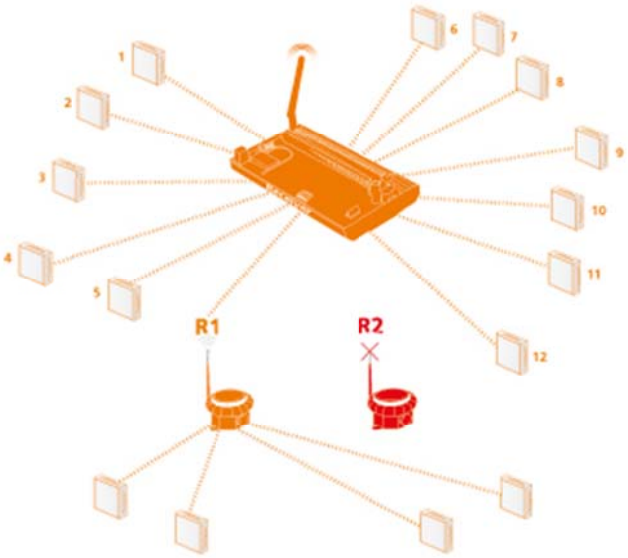
1. At least one router is required, as 16 directly connected EDs will exceed the maximum limit of 12. Four EDs will be orphaned.



2. A single router (R1) will work, but gives no redundancy if the router should fail.



3. Optimal network uses 2 routers, R1 and R2.



4. If either of the routers fail, the network can still be maintained, as the 2 orphaned EDs can re-route via the other router.

The Radio System

The radio system used by the Sontay SonNet devices is divided into 3 sections or 'layers'.

1. The radio layer is where physical control of the radio signal is done. This conforms to international standard 802.15.4, and determines the frequency of the radio signals, the number of 'channels' available for use, the bandwidth and power level of the signal etc. There are 16 channels available, and the best one is automatically selected by the receiver. The frequencies used are in the ISM (Industrial, Scientific and Medical) 2.4GHz band, with a maximum data rate of 250kb/s.
2. The network management layer is where the self-healing tree functionality is run, which controls network topology. 'ZigBee' is an example of a network management MESH protocol. SonNet does not use ZigBee, but instead uses a 'self-healing tree' protocol to control network topology.
3. The application layer determines what the device does – i.e. makes it a temperature sensing device, a router or a receiver. SonNet devices use specific applications, and include features such as configuration properties.

Security

All SonNet system devices have the same, unique network identifier. Only devices with the correct ID will be allowed to join the network. The ID used by system devices is different from the ID used for site survey kit (SSK) devices. Hence, SSK devices cannot join a system network and vice versa. When a SonNet system network has been formed, it can be 'locked' to prevent any unauthorised devices joining, even if they are SonNet devices. The CMS can be used to subsequently authorise extra SonNet system devices if required.

All data transmitted by SonNet devices is encrypted.

How the Self-Healing Tree Network is Formed

The network is formed based on 3 rules, and in a specific order of priority.

1. *How many 'tiers' a device is away from the receiver.*

   If a device can communicate directly with the receiver, it will, even if the link quality is poorer than if it went through a router. If a device has a choice of more than one router, it will *always* choose the router closest to the receiver (the least number of tiers away), *even if the link quality is poor*.

2. *The number of 'child' devices a router already has.*

   A RF-IOM or router can have a maximum of 16 'children'. If a device has a choice of more than one router of the same tier level, it will *always* choose the router with the least number of children, *even if the link quality is poor*.

3. *Signal Strength (link quality).*

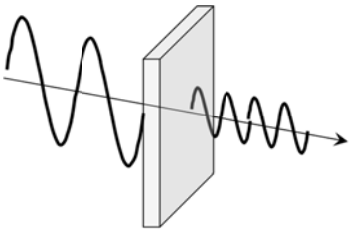
   Finally, if a device has a choice of more than one RF-IOM or router of the same tier level and the same number of children, it will choose the router with the best link quality.

   If, for any reason, a device (ED, RF-IOM or router), loses its preferred path back to the receiver, it will automatically search for an alternative – still obeying the 3 rules above in sequence. If, despite employing Direct Sequence Spread Spectrum (DSSS) techniques, interference on the currently occupied channel prevents communications, the receiver will automatically look for another channel which is clear. All other devices, having lost their links to the receiver, will then also automatically scan the 16 channels until they find the receiver again, and the network will re-form without user intervention.

Propagation of Radio Signals in Buildings

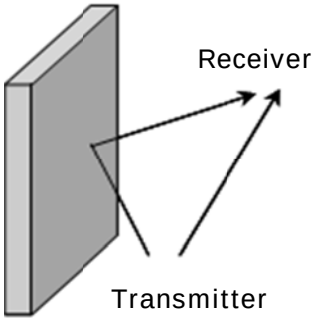
The propagation of microwave radio signals in a building can be affected in several ways:

Attenuation



Radio signal strength is attenuated when it passes through air. Signals are attenuated much more when passing through other media, such as materials typically used in construction, such as brick, stone, wood and especially steel.

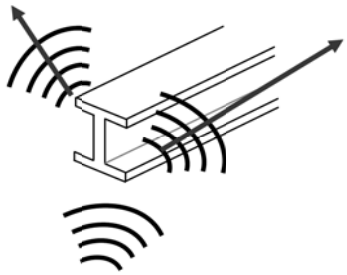
Reflection



Depending on the building, radio signals can take many paths from the transmitter to the receiver, rather than just one single path.

'Multipath' signals can have the effect of cancelling each other out, reducing overall received signal strength.

Scattering



Scattering the radio signal can also reduce its signal strength.

Extension Aerials

When using the **RF-AERIAL-PM2** or **RF-AERIAL-PM5** extension aerials, it is important to observe some basic rules for siting and mounting.

1. Always ensure there is a much clear space around the aerial as possible.
2. Generally speaking, where possible mount the aerial as high as possible on the same floor as the routers and EDs
3. Don't mount between metal surfaces (for example steel I-beams) in ceiling spaces
4. Wherever possible, mount the aerial on a metal ground plane (such as the top of a metal panel)
5. The coaxial cable used for the **RF-AERIAL-PM2** or **RF-AERIAL-PM5** extension aerials is semi-rigid and should not be bent at too sharp an angle or too tight a radius. It is recommended that the minimum bending radius is 5cms
6. Always mount the aerial vertically. This produces the optimum radiation pattern and signal strength
7. Extension aerials can be used with receivers and RF-IOM modules.
8. Aerial extensions should not exceed 5m to prevent excessive loss of signal.

FAQs

a. *How is access to the sensor network locked at the CMS?*

Nodes are only allowed to join the network if the receiver allows them to. This is true even if the nodes are identified as SonNet Nodes and have the correct encryption key.

There are two methods to configuring the receiver to accept nodes on to the network. In order to authorise a node the CMS must be in administration mode (File->Switch Admin Mode must be ticked).

- Auto Commissioning Mode

The CMS allows the receiver to be switched to auto commissioning mode. In this mode any nodes that can correctly identify themselves as SonNet nodes will be allowed to join the network. Any nodes that do join will be added to the CMS textual display.

- Manual Mode

In manual mode individual nodes can be removed from or added to the authorised node list from the CMS. Manual mode is the default mode.

A node can then be authorised by Options->Authorise (add) a new node or selecting the same option on the right click menu in the Textual or Graphical parts of the application display.

The user must type the MAC address (found on the PCB or product housing) of the new node into the dialog that appears and can also give the node a textual name (up to 10 characters)

b. *Why do some menu items disappear if the CMS application is idle for some time?*

The CMS has a timeout that operates when in Admin mode. If there is no activity for some time the CMS application will exit admin mode and some admin menu items will be disabled or removed.

The timeout can be set in Options-> Change Idle Time.

Admin mode can be entered again in File->Switch Admin Mode

c. *The CMS application right click menu has stopped being provided. Why?*

This probably means that the CMS has detected that the receiver has been disconnected from the PC. This will be indicated on the status bar at the bottom left side of the CMS application window "Receiver Disconnected". In this state many of the CMS facilities are disabled until the Receiver is connected again.

d. *How are the network node names stored, are they persistent?*

The node names are stored in the receiver's non-volatile memory. Therefore these will be the same even if a different PC is attached to the system, or the receiver is reset or power cycled.

e. *In the CMS application, what is an "Unknown" node?*

The application will list all nodes that have been added to the system as unknown initially. As soon as a node is added (either manually or by the use of auto commissioning mode) a request is sent to it to establish what type of node it is and what capabilities it has.

As a result a node will be categorized as unknown until a response is received from it. If the node remains off-line or does not respond for any other reason it will remain in this category.

The CMS will send a request each time it is started if there are still unknown nodes in the system.

f. *What are the ranges of the **RF-RX20** and **RF-RX40** receiver 0-10Vdc outputs?*

Temperature	-10°C to +70°C
RH	0% to +100%
Setpoint	0% to +100%
Switch	
0Vdc = OFF (False)	
10Vdc = ON (True)	
CO_2	0 – 2000ppm
Fan Speed	
0Vdc = Off	
2.5Vdc = Lo	
5.0Vdc = Med	
7.5Vdc = Hi	
10.0Vdc = Auto	
VFC	
0Vdc = OFF (False)	
10Vdc = ON (True)	
PIR	
0Vdc = Unoccupied (False)	
10Vdc = Occupied (True)	

Configuration & Monitoring Software (CMS)

The CMS is connected, *via* USB, to a Sontay® **RF-RX20**, **RF-RX40** or **RF-RXS** receiver, and is used to configure:

- Receiver output channel mapping (not **RF-RXS**)
- ED node parameters, including;
  - Configuration settings
  - User-defined labels
- Router node parameters, including;
  - Configuration settings
  - User-defined labels
- RF-IOM node parameters, including;
  - Default measurement data transmission time
  - Send on value change settings
  - Analogue output fall-back values
  - Input alarm levels
  - User-defined labels

It can also be used for;

- Enabling or disabling automatic configuration mode
- Manually adding or removing nodes
- Providing a text and graphical display of the wireless network
- Monitor device status
- Monitor link and battery quality
- View logs for receiver configuration changes

The CMS installation procedure installs 3 components:

- Microsoft® SQL Server 2005 Express Edition SP2
- Sontay® SonNet CMS
- Sontay® device USB device drivers

NB It is important that the CMS installation be completed ***prior*** to connecting the PC to the receiver.

Important: DO THIS FIRST *– Disabling Driver Signing Verification*

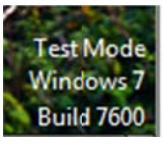
Prior to installing CMS, driver signing may need to be disabled.

Windows 7 64-bit

- From the Start menu, type cmd.exe in the search bar. Right click on cmd.exe and choose run as administrator.
- Run the following commands in the shell.

bcdedit.exe -set loadoptions DDISABLE_INTEGRITY_CHECKS
bcdedit.exe -set TESTSIGNING ON

- Restart the PC. When logged, the following will be displayed in the bottom right corner of the desktop:



Windows 8

- Place the mouse (do not click) at the bottom-right-corner of the screen and wait for the pop-out bar to appear, Then click the Settings (Gear icon).
- Click Change Pc Settings.
- Click “General”.
- Scroll down, and click “Restart now” under “Advanced Startup”.
- Click “Troubleshoot”.
- Click “Advanced Options”
- Click “Windows Startup Settings”
- Click Restart.
- After the PC restarts, select “Disable Driver Signature Enforcement” from the list.
- The PC will reboot automatically

Windows 8.1

- Place the mouse (do not click) at the bottom-right-corner of the screen and wait for the pop-out bar to appear.
- In the Search Box start to type 'Advanced Start Up' and you should see 'Change Advanced Startup Options' Click on it.
- Click 'Restart Now' Under Advanced Start Up'
- After the PC restarts, select “Disable Driver Signature Enforcement” from the list.
- The PC will reboot automatically

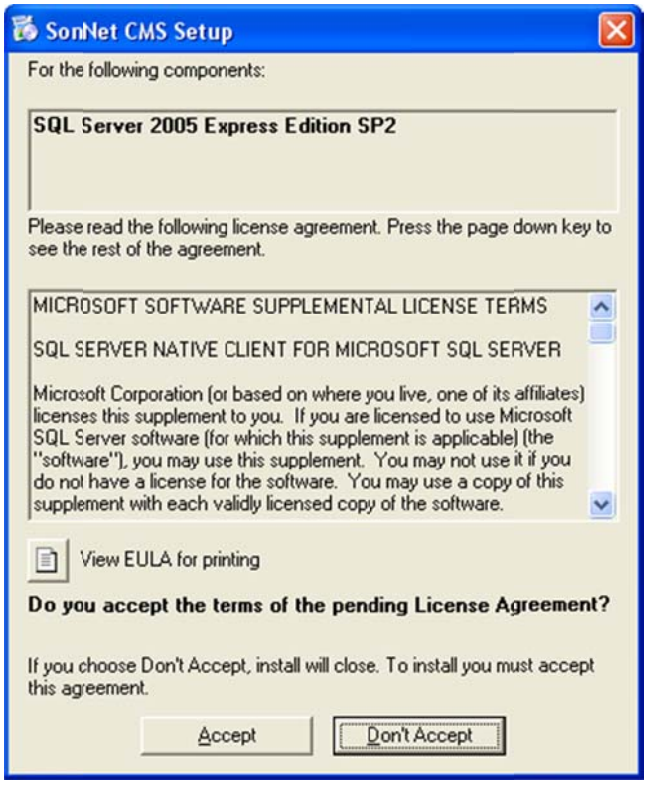
Windows 10

- Select “Restart” from the power options menu from the Start Menu.
- Hold down the SHIFT key while you click Restart.
- Once the computer has rebooted, choose the “Troubleshoot” option.
- From the options available, choose “Advanced options”
- From the options available, choose “Startup Settings”
- Click the “Restart” button
- After the computer has restarted, a list of startup settings is available. “Disable driver signature enforcement”. Choose “Disable driver signature enforcement” by pressing the F7 key.
- The PC will reboot automatically

Microsoft® SQL Server 2005 Express Edition SP2 is installed first, if not already installed, followed by Sontay® SonNet CMS and finally the Sontay® device USB device drivers.
Note that there is an issue with SQL Server 2005 Express Edition SP2 and MSXML 6 SP2 (see Microsoft Knowledge Base article KB954459 for full details). To overcome this, the CMS installation will offer to run the Windows Installer Cleanup Utility to uninstall MSXML6 SP2. When this message appears, click on the <Install> button.

SonNet CMS Setup
The following components will be installed on your machine:
MSXML6 SP2 / SQLExpress 2005 Cleanup
Do you wish to install these components?
If you choose Cancel, setup will exit.
Install
Cancel

Installing CMS


SonNet CMS Setup
For the following components:
SQL Server 2005 Express Edition SP2
Please read the following license agreement. Press the page down key to see the rest of the agreement.
MICROSOFT SOFTWARE SUPPLEMENTAL LICENSE TERMS
SQL SERVER NATIVE CLIENT FOR MICROSOFT SQL SERVER
Microsoft Corporation (or based on where you live, one of its affiliates) licenses this supplement to you. If you are licensed to use Microsoft SQL Server software (for which this supplement is applicable) (the "software"), you may use this supplement. You may not use it if you do not have a license for the software. You may use a copy of this supplement with each validly licensed copy of the software.
View EULA for printing
Do you accept the terms of the pending License Agreement?
If you choose Don't Accept, install will close. To install you must accept this agreement.
Accept
Don't Accept

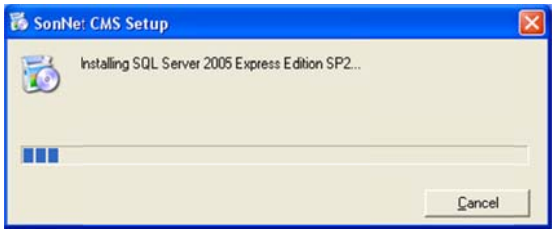
NB It is important that the CMS installation be completed ***prior*** to connecting the PC to the receiver. Ensure that the PC on which you are installing the CMS is **NOT** connected to the receiver until the installation is complete.

The CMS is compatible with Microsoft® Windows XP SP2 or later, Vista and Windows 7. The CMS installation CD comes with all required programme files and drivers, and includes Microsoft® SQL Server Express SP2.

NB You must be logged in to Windows with an administrator level user account to install the Sontay® CMS and Microsoft® SQL Server Express SP2.

If SQL Server 2005 Express Edition SP2 is not already installed on your PC, the following installation will be executed.

When the SQL Server 2005 Express Edition SP2 installation window appears, read the EULA and then click the <Accept> button.

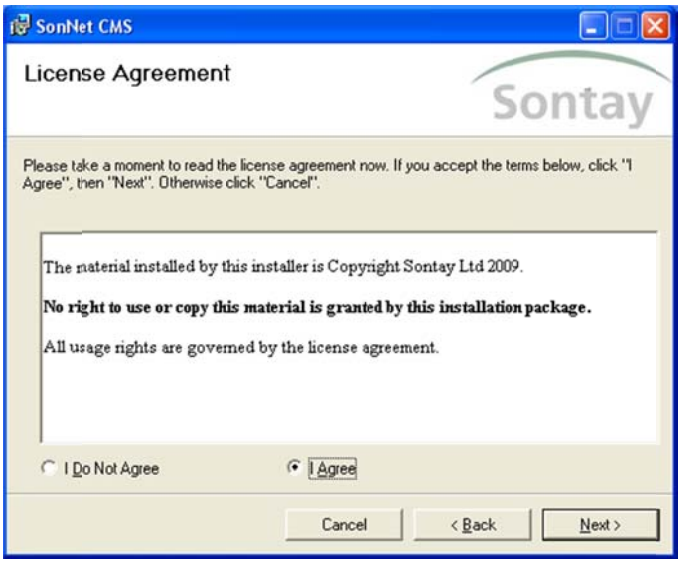


The installation of SQL Server 2005 Express Edition SP2 continues until complete.

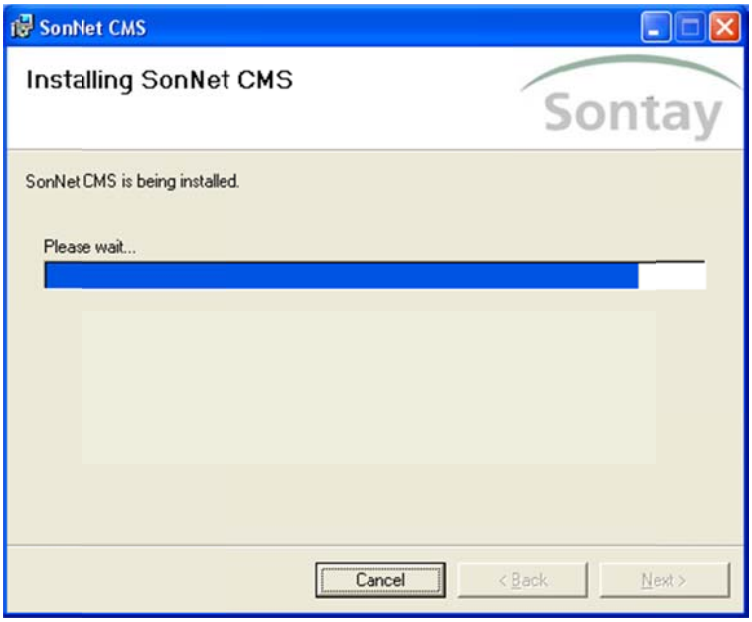
SonNet CMS
Welcome to the SonNet CMS Setup Wizard
Sontay
The installer will guide you through the steps required to install the SonNet CMS on your computer.
WARNING: This computer program is protected by copyright law and international treaties. Unauthorized duplication or distribution of this program, or any portion of it, may result in severe civil or criminal penalties, and will be prosecuted to the maximum extent possible under the law.
Cancel
< Back
Next >

The next step in the installation procedure will display the "Welcome to the SonNet CMS Setup Wizard. Click the <Next> button to continue.

Select <I Agree> and then click the <Next> button to continue.

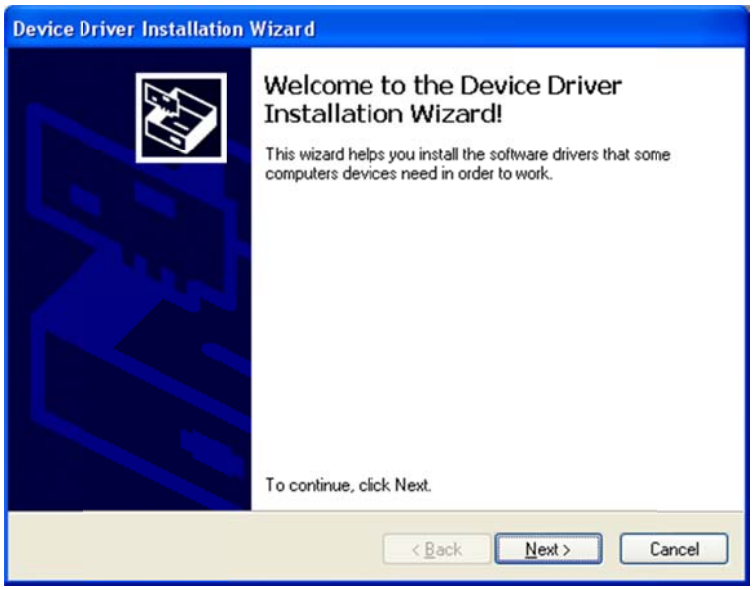

SonNet CMS
License Agreement
Sontay
Please take a moment to read the license agreement now. If you accept the terms below, click "I Agree", then "Next". Otherwise click "Cancel".
The material installed by this installer is Copyright Sontay Ltd 2009.
No right to use or copy this material is granted by this installation package.
All usage rights are governed by the license agreement.
I Do Not Agree
I Agree
Cancel
< Back
Next >

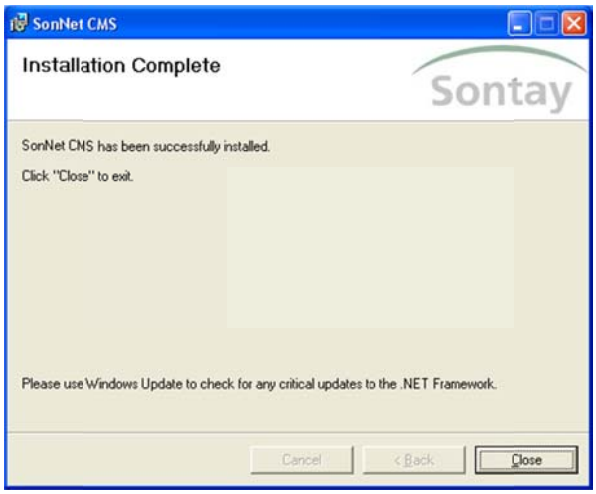
SonNet files are copied to your PC.



A separate window opens to allow the installation of the 2 device drivers required for the USB receiver connection.

To install these, click the <Next> button to continue.


Device Driver Installation Wizard
Welcome to the Device Driver Installation Wizard!
This wizard helps you install the software drivers that some computers devices need in order to work.
To continue, click Next.
< Back
Next >
Cancel



When the installation is complete, click the <Close> button.

Starting CMS

When a receiver is first connected to a USB port and switched on, the device manager will detect a new device. Follow these steps to install the drivers for the receiver. **NB** - This procedure will need to be followed each time a new receiver is connected to the PC, as each USB port on a receiver has a unique ID number.

Found New Hardware Wizard
Welcome to the Found New Hardware Wizard
Windows will search for current and updated software by looking on your computer, on the hardware installation CD, or on the Windows Update Web site (with your permission).
Read our privacy policy
Can Windows connect to Windows Update to search for software?
Yes, this time only
Yes, now and every time I connect a device
No, not this time
Click Next to continue.
< Back
Next >
Cancel

Select the option shown ("No, not this time")

Found New Hardware Wizard
This wizard helps you install software for:
Wireless Sensor Receiver
If your hardware came with an installation CD or floppy disk, insert it now.
What do you want the wizard to do?
Install the software automatically (Recommended)
Install from a list or specific location (Advanced)
Click Next to continue.
< Back
Next >
Cancel

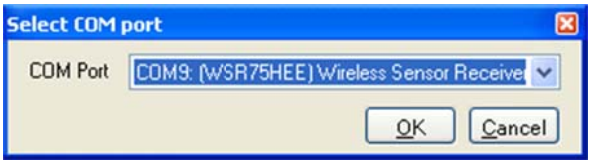
Select the option shown ("Install the software automatically")

Software Installation
The software you are installing has not passed Windows Logo testing to verify its compatibility with Windows XP. (Tell me why this testing is important.)
Continuing your installation of this software may impair or destabilize the correct operation of your system either immediately or in the future. Microsoft strongly recommends that you stop this installation now and contact the software vendor for software that has passed Windows Logo testing.
Continue Anyway
STOP Installation

When prompted, click the <Continue Anyway> button to continue.

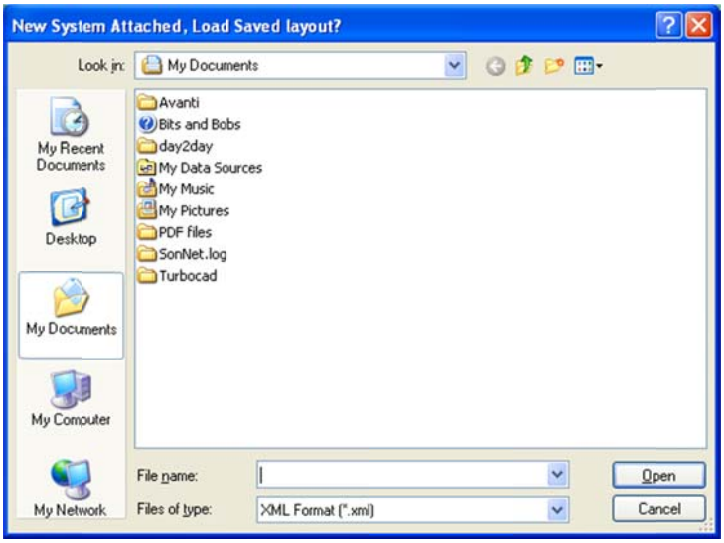
There are 2 drivers to be installed, follow the same procedure for both drivers.

When the CMS is started, the PC com port connected to the receiver USB port needs to be defined.



Importing a Saved Layout

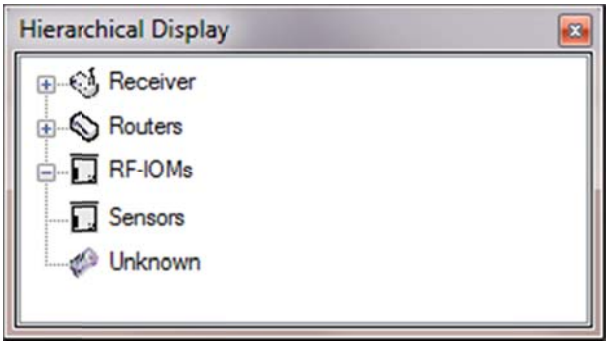
When first run, the CMS may also ask if the user requires a saved XML layout file to be imported. This is useful if an existing layout has been saved on a site where the PC running CMS has been replaced.



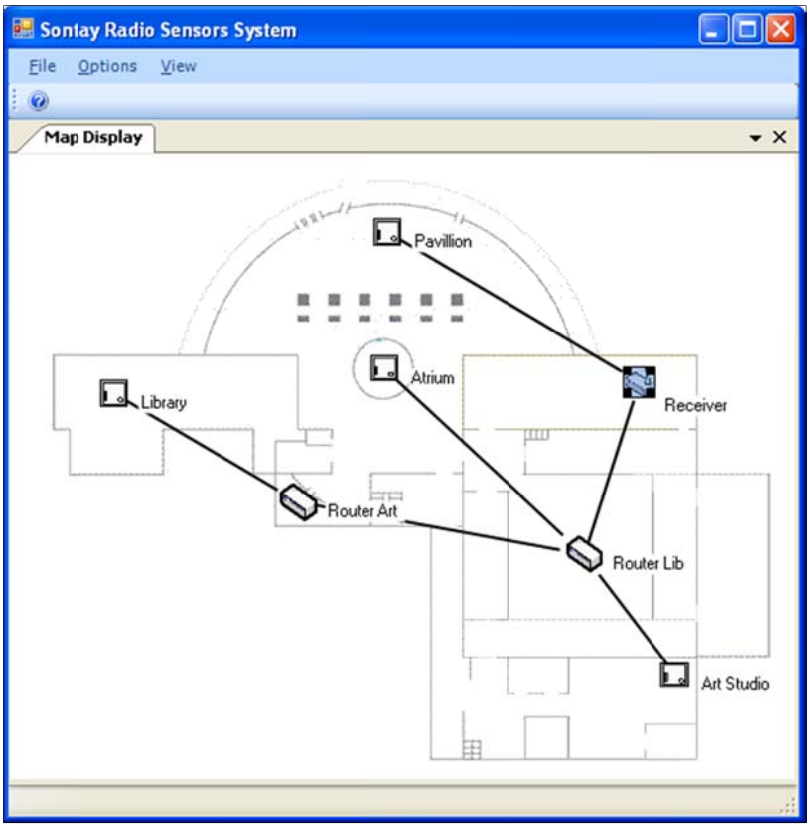
If no layout file is required, click the <Cancel> button to continue, otherwise navigate to the saved layout file to and click the <Open> button import it.

The CMS Desktop Environment

The CMS desktop is divided into 2 parts, a textual hierarchical display



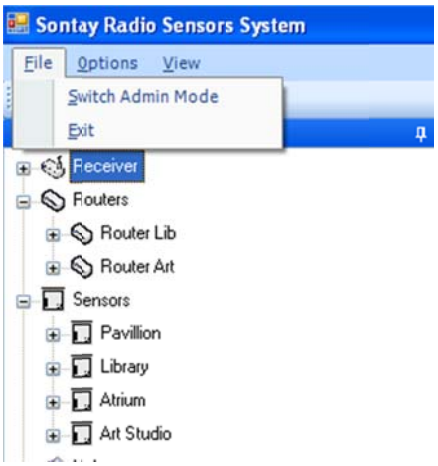
and a graphical “map” display.



To enable the text display panel, from the menu bar choose <View> then <Textual Display>

To enable the graphical display panel, from the menu bar choose <View> then <Graphical Display>

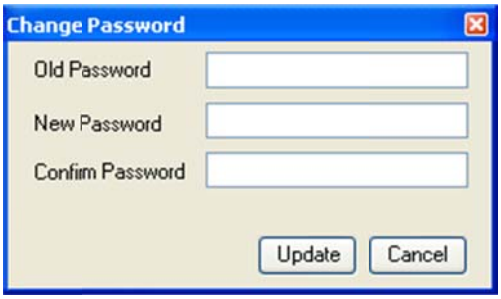
Logging On as an Administrator



To make any changes to device configuration or to create or modify the graphical display, you must first log on as an administrator. To do this, from the menu bar choose <File> then <Switch Admin Mode>

The login box appears. Type in your admin level password. **NB** The default admin level password is *admin* (case sensitive). This can be changed once you have logged in.

Changing the Administrator Password



To change the admin password, from the menu bar choose <File> then <Change Password>. Enter the existing password, enter your new password and confirm. Click the <Update> button to submit the change, or click <Cancel>.

Auto Commissioning Mode

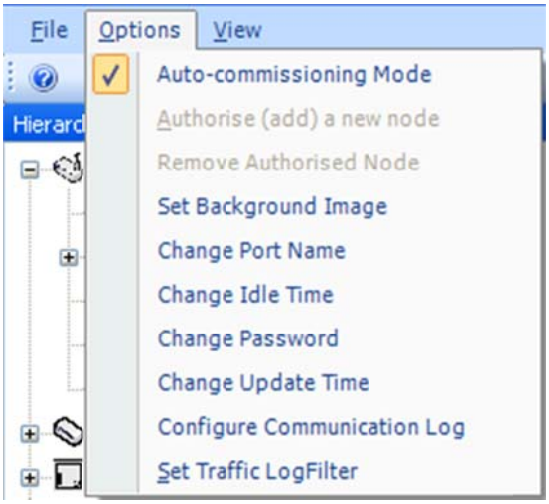
IMPORTANT!

When a new radio system network is being commissioned for the first time, it is advisable to place the receiver in automatic commissioning mode for the network to form.

If this is not done, the network is treated as secure, and will not allow any nodes or routers to join the network without manually authorising each device (this involves entering the device MAC address).

To place the receiver and network in automatic commissioning mode, ensure you are logged on as an administrator.

From the menu bar, select <Options> and click <Auto-commissioning Mode>. A tick beside this option denotes that this special mode is enabled



The status bar of CMS displays whether the receiver is in auto-commissioning mode or if the network is locked.

Network Locked

Auto-commissioning mode

When the network has formed completely, and all devices can be viewed in the CMS, it is **strongly recommended that the receiver and network be taken out of auto-commissioning mode**. Do NOT try to make configuration changes while in auto-commissioning mode. This may cause network errors.

To take the receiver and network out of auto-commissioning mode, ensure you are logged on as an administrator.

From the menu bar, select <Options> and click <Auto-commissioning Mode>. There should not be a tick beside this option, and denotes that this special mode is disabled.

This secures the network and ensures that unauthorised nodes cannot join the network.

To prevent leaving CMS in an admin state when not supervised, the admin log-in status automatically times out after the time set in the “Change Idle Time” setting expires. To disable this feature (**not recommended**), or to change the timeout value, from the menu bar choose <Options> then <Change Idle Time>

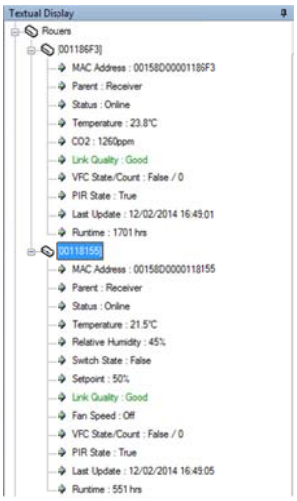
Removing the tick the Enable Idle Time Out box disables admin timeout feature. The timeout value can also be changed.

List Devices

In the text display panel on the left of the window, a list of all devices on the network can be found. These devices are divided into 4 main categories, receiver, routers, RF-IOMs and battery powered sensor nodes.

Receiver

Routers



EDs

RF-IOMs

Each category can be expanded to view more detail or collapsed to hide detail.

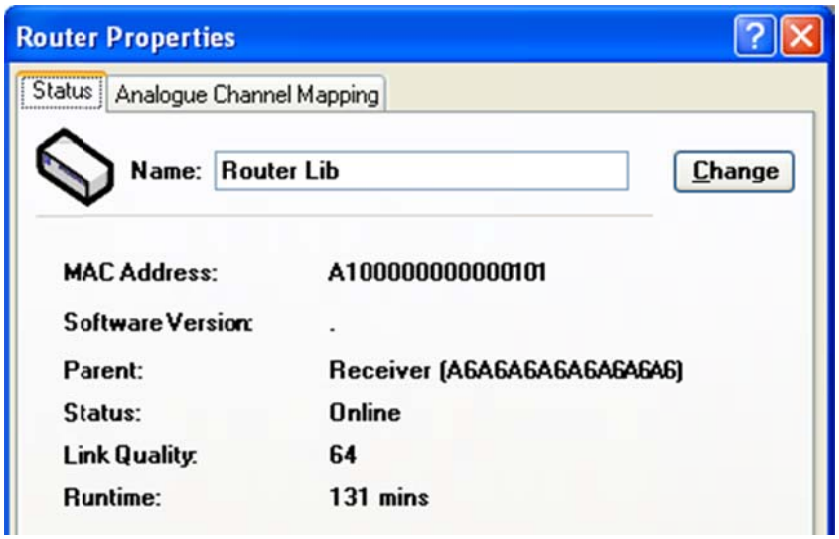
The “Unknown” category is initially populated by devices which are joining the network for the first time, either by auto-commissioning or manual authorization. Devices are held in the unknown category until CMS has determined the type of device trying to join (for example, a router or node) and which options, if any, are fitted (such as setpoint). When CMS has determined this information, the device will then automatically be placed in its appropriate category.

Note that for the RF-IOM, if an input is in an alarm condition, that input will be displayed in red in the text display (see screen shot above).

Changing Device Labels

NB - Do **NOT** try to make configuration changes while in auto-commissioning mode. This may cause network errors.

Each device, when first depicted in the CMS, has a default label, such as “Router1” or “Sensor2”. To give the router a more meaningful label, right click on the router and choose <Properties>



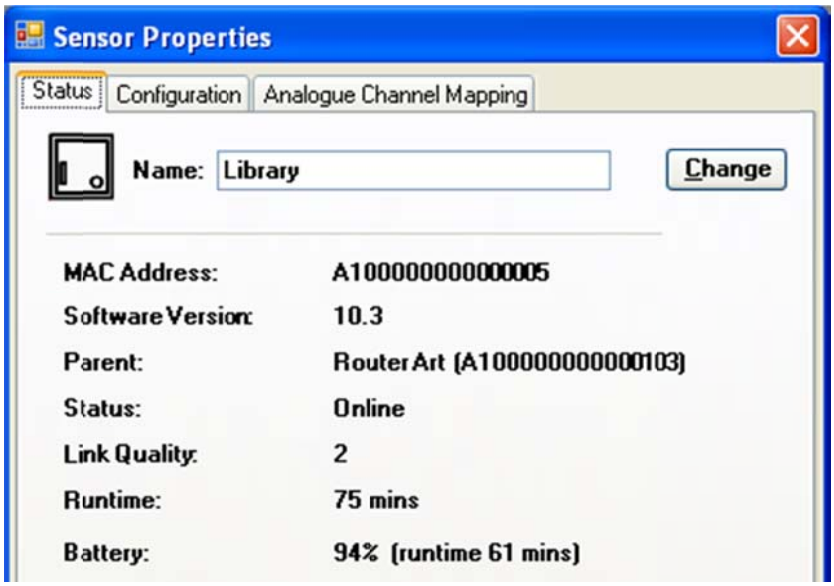
In the <Name> box, type in the new name you require and click the <Change> button.

NB There is a limit of 10 ASCII characters for router names.

To give a sensor a more meaningful label, right click on the sensor and choose <Properties>

In the <Name> box, type in the new name you require and click the <Change> button.

NB There is a limit of 10 ASCII characters for sensor names.



Creating Analogue Output Channel Mapping (*not* **RF-RXS**)

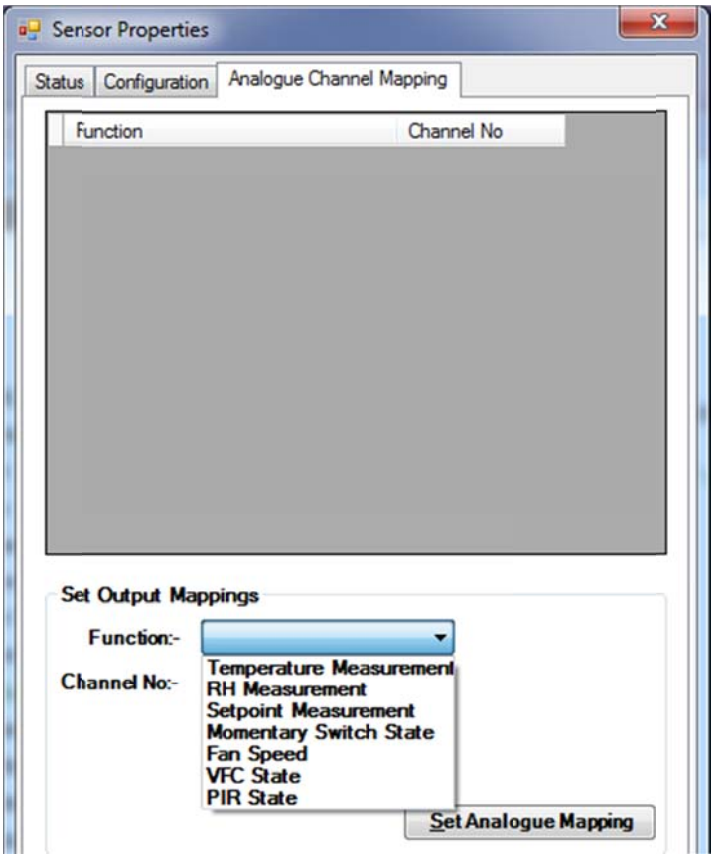
Do **NOT** try to map output channels while in auto-commissioning mode. This may cause network errors.

Each sensor has at least one measured value, and with options fitted can have up to 4 measured values. These values need to be "mapped" or assigned to a unique 0-10Vdc output channels on the receiver.

Parameters which can be mapped to an output channel are:

- Temperature
- Relative Humidity
- Setpoint level
- Momentary switch status
- CO2
- PIR Status (routers only)
- VFC status
- Fan Speed Value. The following output voltages represent the fan speed status;
    - OFF = 0V
    - Low = 2.5V
    - Med = 5.0V
    - Hi = 7.5V
    - Auto = 10.0V

To map these parameters, first select the sensor (or router with sensing element).



Right-click on the device, and select <Properties> from the drop-down menu.

Select the <Analogue Channel Mapping> tab.

Using the <Function> list box, select which device parameter to map.

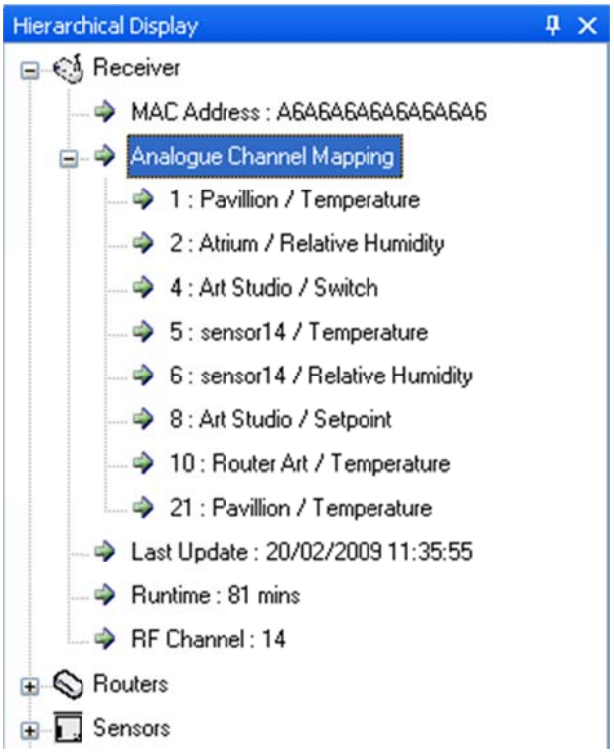
Using the <Channel No.> list box, select the output channel to map to.

Click the <Set Analogue Mapping> button to accept the changes, or the <Close> button to exit with accepting the mapping changes.

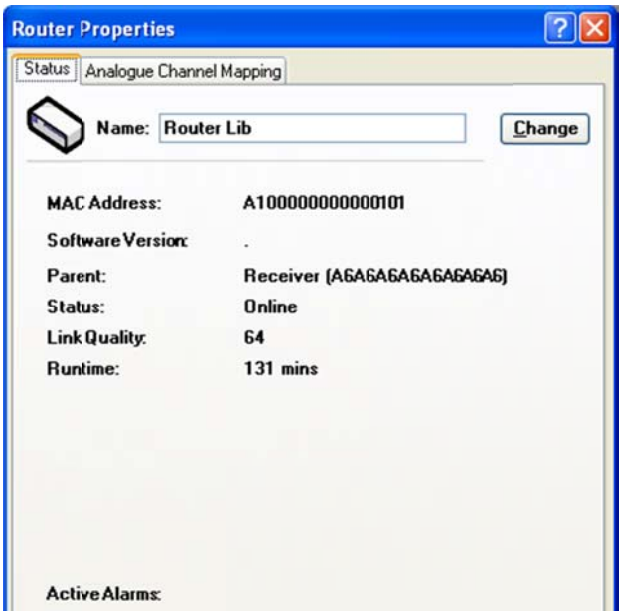
Repeat this operation for all device parameters, and for all devices.

To remove an analogue channel mapping, follow the steps above, but select <No Mapping> from the <Channel No.> list box.

Viewing Device Properties


Hierarchical Display
Receiver
MAC Address : A6A6A6A6A6A6A6A6
Analogue Channel Mapping
1 : Pavillion / Temperature
2 : Atrium / Relative Humidity
4 : Art Studio / Switch
5 : sensor14 / Temperature
6 : sensor14 / Relative Humidity
8 : Art Studio / Setpoint
10 : Router Art / Temperature
21 : Pavillion / Temperature
Last Update : 20/02/2009 11:35:55
Runtime : 81 mins
RF Channel : 14
Routers
Sensors

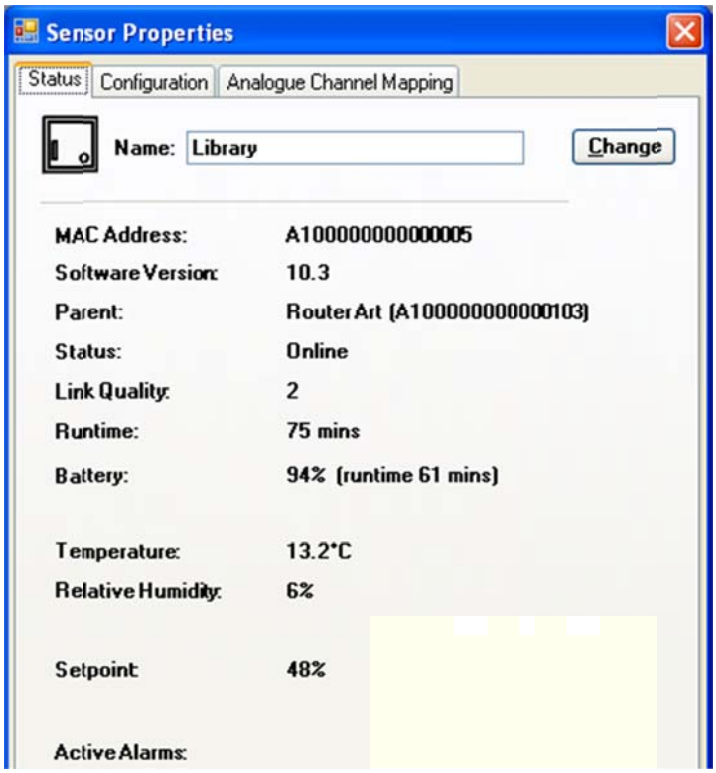
To view the current analogue output channel mappings, expand the receiver in the text display.



The specific properties of any device can be viewed by right-clicking a device and selecting <Properties> in the drop-down menu.

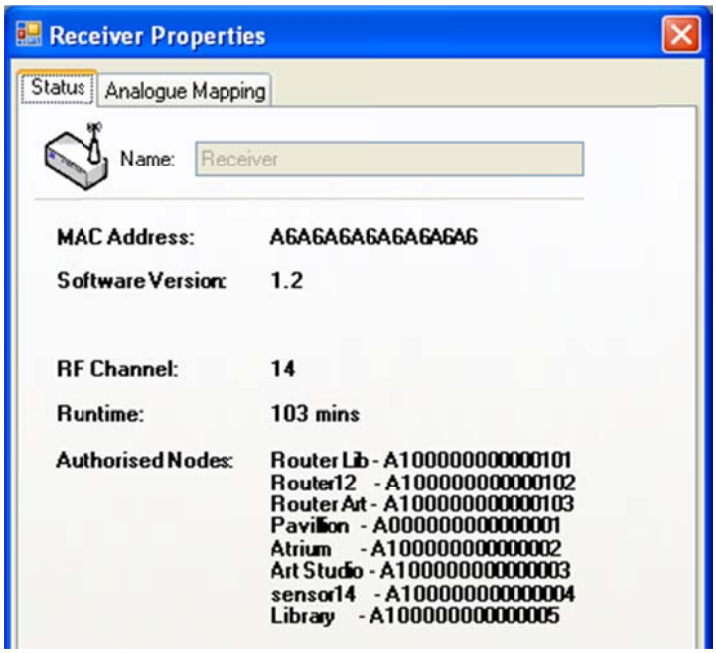
Available router properties are:

Parent (if applicable)
MAC address
Software version
Status
Link Quality
Runtime
Any active alarms



Available sensor properties are:

Parent (if applicable)
MAC address
Software version
Status
Link Quality
Runtime
Battery level
Any measured values
Any active alarms



Available receiver properties are:

MAC address
Software version
RF channel used
Runtime
Authorised nodes

Changing Device Configurations

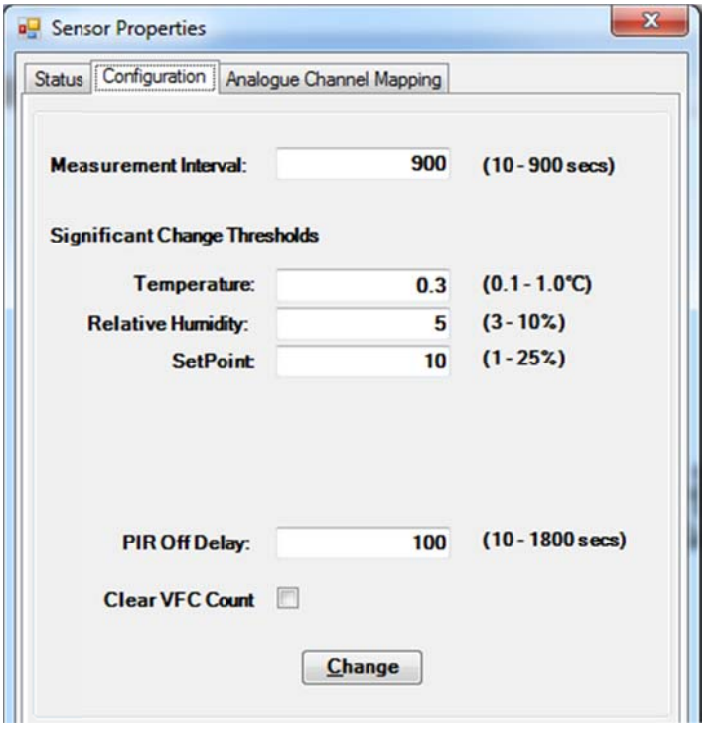
Do NOT try to make configuration changes while in auto-commissioning mode. This may cause network errors.

Battery powered nodes have configurable parameters. The setting of these can be important for battery powered devices, as these will affect battery life. For example, if a temperature sensor in a room is set up to transmit its value every 10 seconds, the battery life will be less than if the sensor were set to transmit values every 5 minutes.

Consideration should be given to each device and how often it should send values and still maintain the required level of control to maximise battery life. However, setting a transmission interval to a high level may result in having to wait for the set interval time to elapse before current data is shown when re-connecting the CMS to a receiver.

Temperature in a room doesn't normally change by a significant amount in a few minutes, RH even less so.

Setpoint values are only sent if the value changes by a configurable level. The same is true for the momentary switch, VFC and PIR; data is only transmitted on a change of status (ON or OFF).



Temperature, RH and CO_2 can also be configured to send on a "significant change of value". These values are also configurable by the administrator.

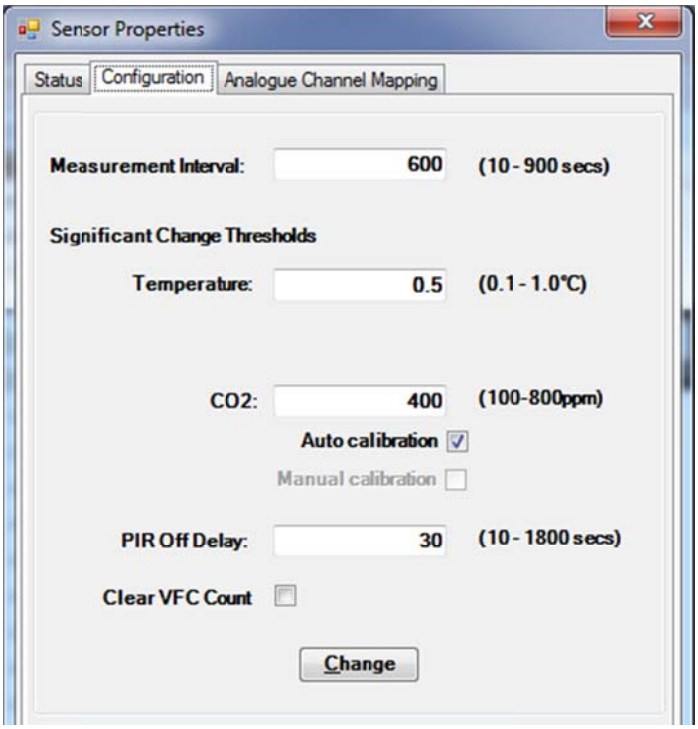
Configurable Parameters

To view or change battery powered sensor node parameters, right-click on the required device and select <Properties> from the drop-down menu. Select the <Configuration> tab.

- Measurement interval
- Temperature change threshold
- RH change threshold
- Setpoint threshold
- PIR Off Delay
- Clear VFC Count

When all changes are complete, click the <Change> button to accept the changes, or the <Close> button to exit without accepting the changes.

Where a CO2 device is to be configured, the following configuration settings are available;

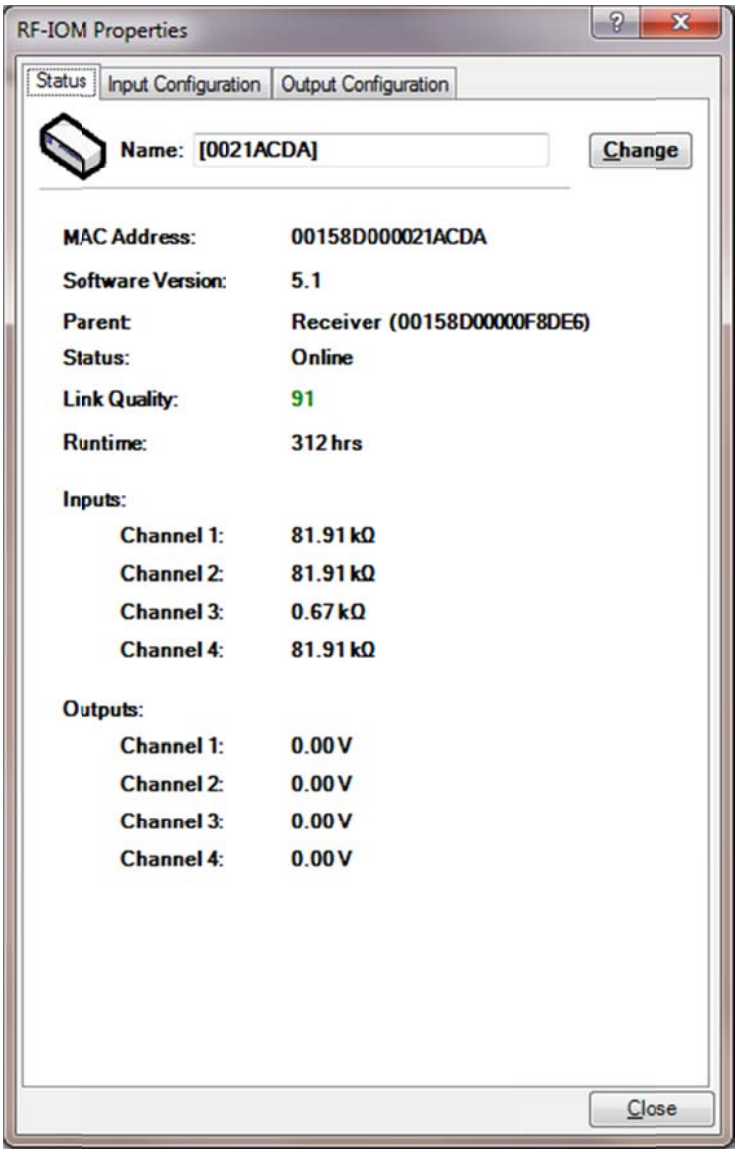


- Measurement interval
- Temperature change threshold
- RH change threshold
- CO2 change threshold
- CO2 Auto calibration function
- PIR Off Delay
- Clear VFC Count

When all changes are complete, click the <Change> button to accept the changes, or the <Close> button to exit without accepting the changes.

RF-IOM Configuration

RF-IOM Status Tab



To change the name of an RF-IOM, In the <Name> box, type in the new name you require and click the <Change> button.

NB There is a limit of 10 ASCII characters for device names.

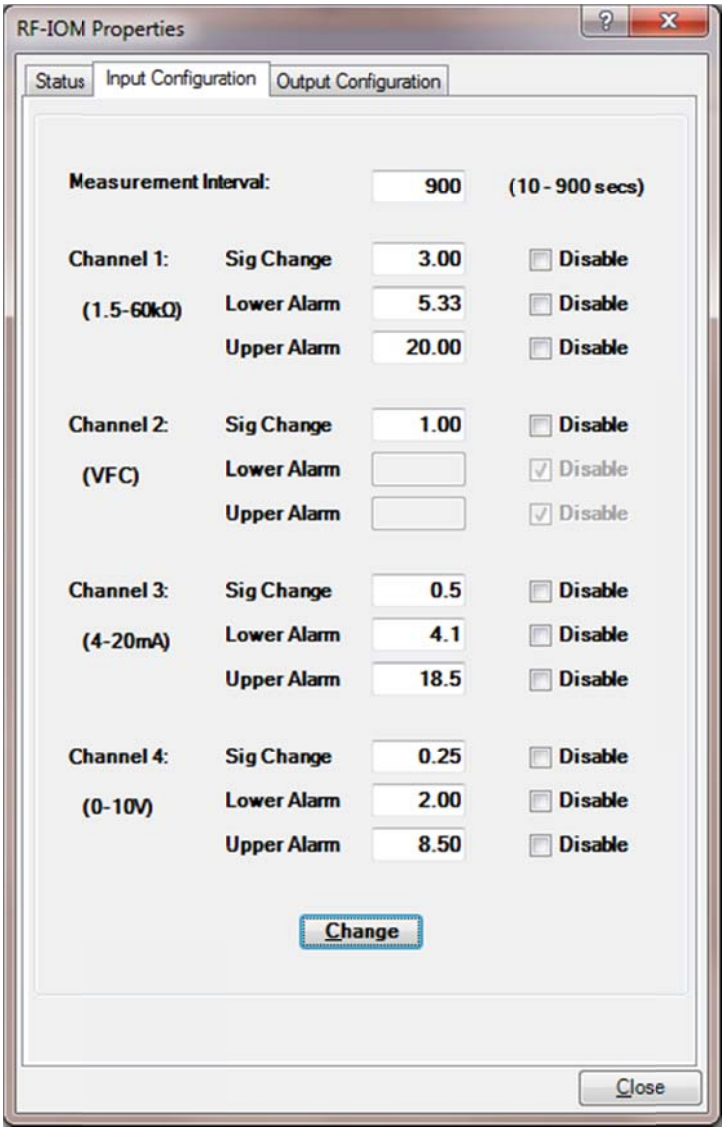
Information displayed on the <Status> tab include;

- MAC address
- Firmware version
- Parent MAC address
- Status
- Link quality (to parent)
- Device runtime
- Current input types
- Current input values
- Current output values

Changing the input configuration

Each of the 4 inputs can be set as either;

- 4-20mA current (loop powered or 3-wire)
- 0-10Vdc
- Resistance (between the limits of 1.5kΩ and 60kΩ)
- Digital input (volt free contact only)



To enable or disable significant change of value actions, tick or un-tick the appropriate box for each input.

To set a new measurement interval, enter the required level in the appropriate box.

To enable or disable high and/or low alarms, tick or un-tick the appropriate box for each input.

To set high alarm, low alarm or COV values, enter the required level in the appropriate box.

Notes:

1. Alarm levels are not available where an input is set as VFC
2. The units for alarm levels and COV are dependent on the input type. For example, if an input is set to mA, then the units for COV and alarm levels are also in mA.

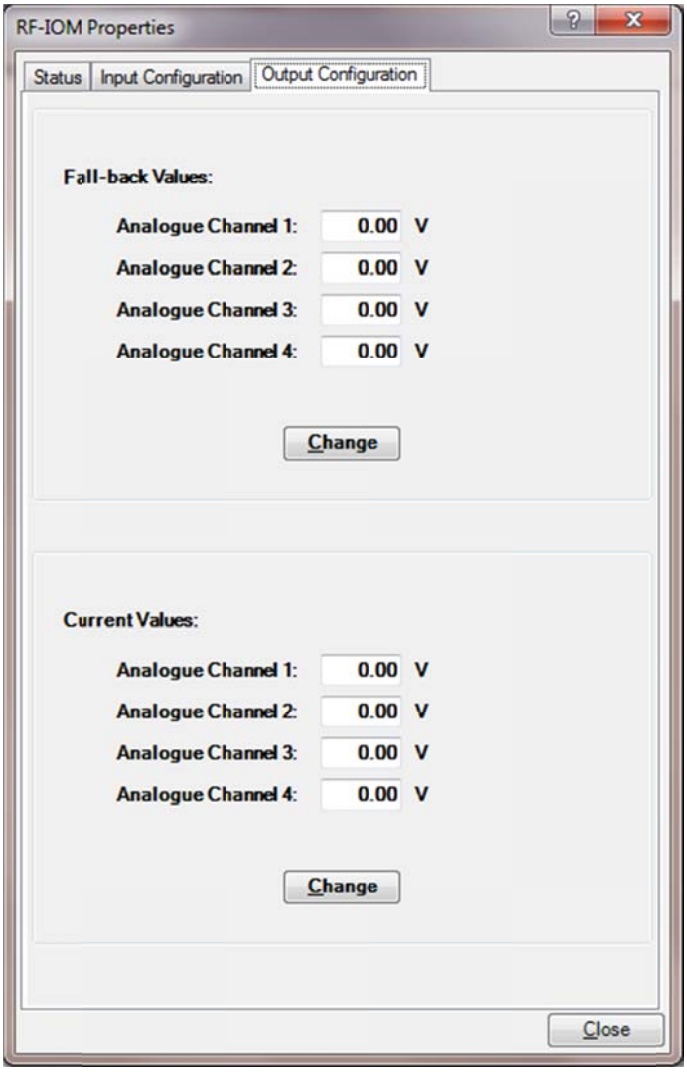
Important! Click the <Change> button after changes are made.

NB - After making changes to the input mode jumpers, the reset button must be pressed for the RF-IOM to update the input mapping.

Changing the output configuration

Each of the 4 outputs is fixed as a linear 0-10Vdc output.

Output values can be written using the Output Configuration tab.



To set an output to a new level, enter to required voltage in the appropriate <Current Values> box and click the <Change> button.

Fall-back Settings

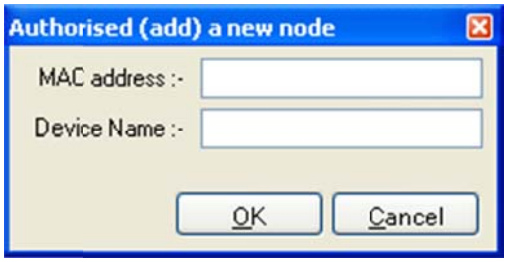
Fall-back settings can be used to force the analogue outputs to pre-determined values if the RF-IOM loses communications to the parent receiver and therefore cannot update correct control values. Under these circumstances, it may be desirable to ensure outputs are forced to 0V (in most cases, an OFF state).

NB - Fall-back values WILL be used if the RF-IOM loses communications to the parent receiver. Careful consideration should be given to the values used.

To set a fall-back output value to a new level, enter to required voltage in the appropriate <Fall-back Values> box and click the <Change> button.

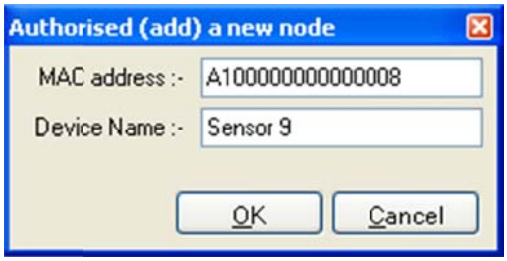
Manually Authorising a New Node

When adding an additional node to an existing system, **it is strongly recommended that the auto-commissioning method is not used** unless the number of new nodes to be added becomes time-prohibitive.



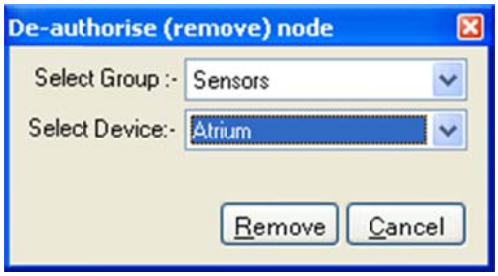
To manually authorise a new node(s), you must be logged on at administrator level. From the menu bar, click on <Options> and then select <Authorise (add) a new node> from the drop-down menu.

You will need to make a note of the unique 16-digit MAC address of the new node, found on the label on the device. Ensure the new device is powered on.



Enter this MAC address and a device label into the appropriate box fields and click <OK> to submit the details, or click <Cancel> to discard the information.

Removing a Node from the Network



To remove a node from the network, from the menu bar, click on <Options> and then select <De-authorise (remove) node> from the drop-down menu. Select the device group (routers, RF-IOMs or sensors) and then select the device by name (label).

Click <Remove> to submit the details, or click <Cancel> to discard the action.

Using the Graphical Map Display

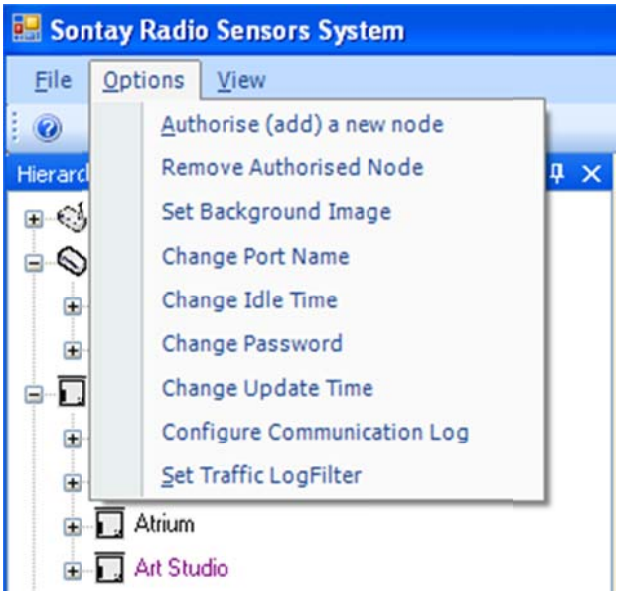
Apart from the text hierarchical display, the CMS offers a graphical environment which allows users to quickly determine how the network is functioning.

By default, there is no graphic image set as a backdrop for the map display.

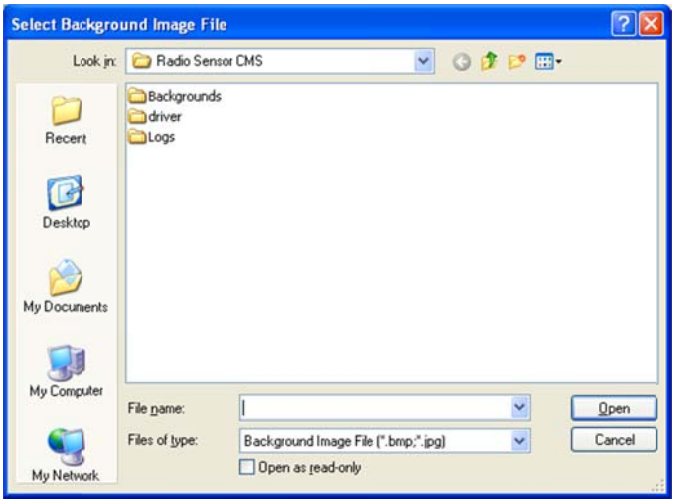
A typical image to use for the map display would be a floor plan of the environment in which the radio network has been installed.

Setting the Map Display Background Image

To set a background image for the map display, you must be logged on at administrator level.



From the menu bar, click on <Options> and then select <Set Background Image> from the drop-down menu.



Browse to the image file required. Image file formats currently supported are:

Bitmap (.bmp)
JPEG (.jpg)

Adding Devices to the Map Display

To add a device to the map display, simply “drag-and-drop” a device from the text hierarchical display onto the graphic background.

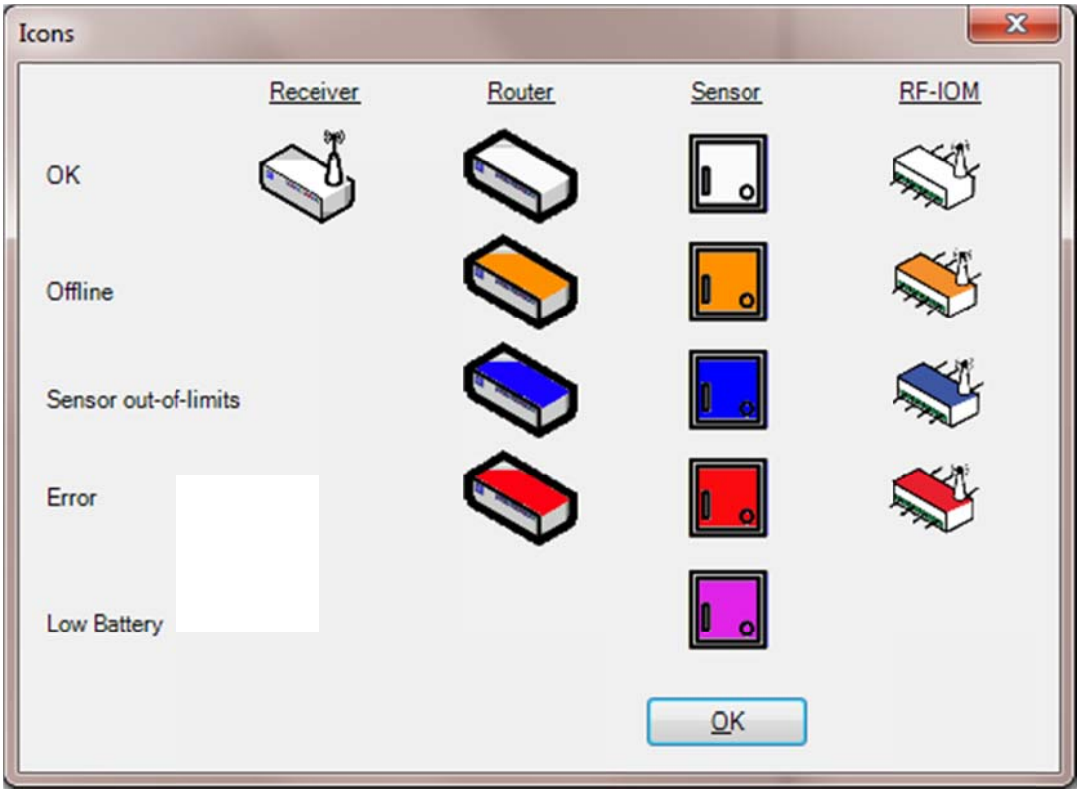
Add the receiver to the graphic first, then routers followed by battery powered nodes. Links are automatically generated, showing the true network architecture.

Different icons are used to depict the receiver, routers and battery powered node, making identification easy. The icons also depict the status of the device, and change to reflect whether a device is OK, off-line, or in alarm.

Icon Plan

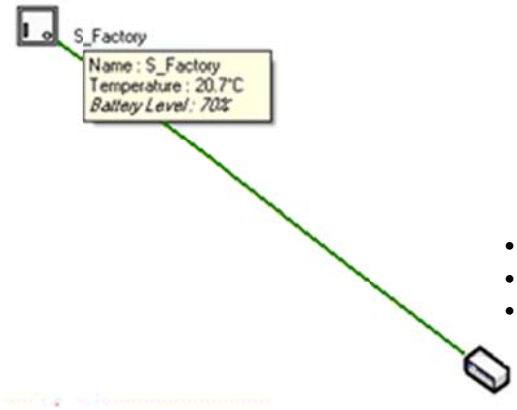
A schedule of what each icon and icon colour can be quickly found from the menu bar, click on <Help> and then select <Icons> from the drop-down menu.

The following pop-up window is displayed:



Device Status

A quick check on a device status can be made by hovering the mouse cursor over a device on the map display.



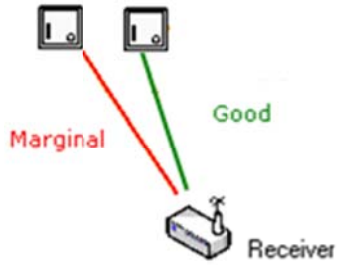
Displayed parameters are device dependent, but include:

- Device name (label)
- All sensor values
- Battery level (battery devices only)

NB Where link quality, hours run and battery level are shown in *italics*, this denotes that a request for data has been sent to a device, but the device has not yet responded.

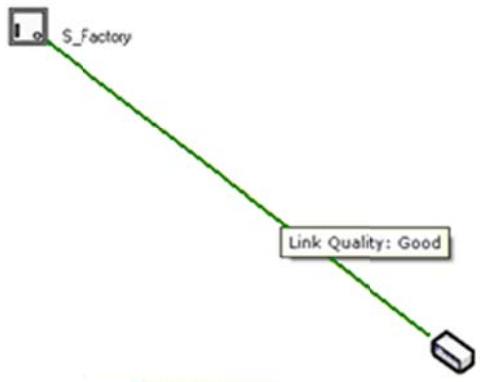
Link Status

The link status is represented graphically by the colour of the link drawn.



Green: Indicates good link quality.

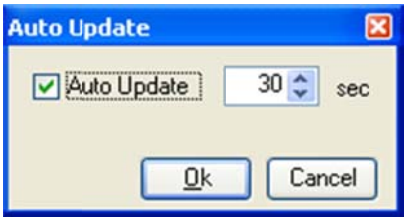
Red: Indicates marginal link quality.



A quick check on any link status can be made by hovering the mouse cursor over a link on the map display.

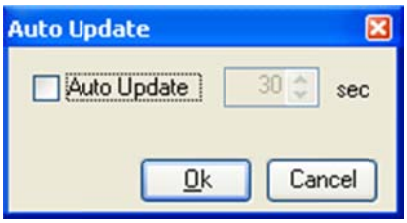
Auto Updating

The CMS can be configured to update at a user configurable rate.



From the menu bar, click on <Options> and then select <Change Update Time> from the drop-down menu. Adjust the update time accordingly. Click <OK> to submit the change, or click <Cancel> to discard the change.

Auto updating can also be disabled.

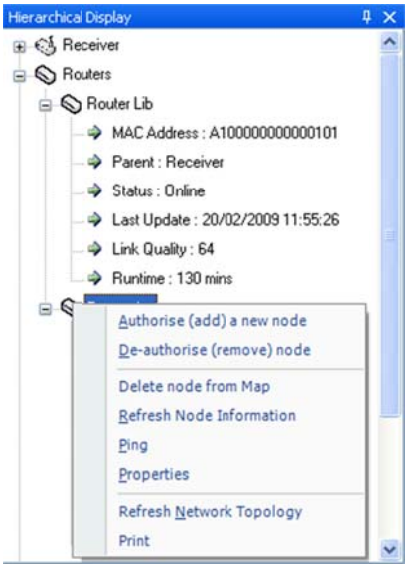


From the menu bar, click on <Options> and then select <Change Update Time> from the drop-down menu. Remove the tick from the <Auto Update> box. Click <OK> to submit the change, or click <Cancel> to discard the change.

Manual Refreshing Of Data

NB - Do NOT try to update device information while in auto-commissioning mode. This may cause network errors.

Node or network data can be manually refreshed. **This is an important feature when re-connecting the CMS to an existing network**.



When re-connecting the CMS to a receiver on an existing network, data will only be refreshed to the CMS as and when a device updates its information by timed transmission.

To ensure all data is sent as soon as possible, use the Refresh Node Information or Refresh Network Information options.

To manually refresh node data, right click on a node and then select <Refresh Node Information> from the drop-down menu.

To manually refresh network data, right click on a blank space (on the text or graphical display) and then select <Refresh Network Information> from the drop-down menu.

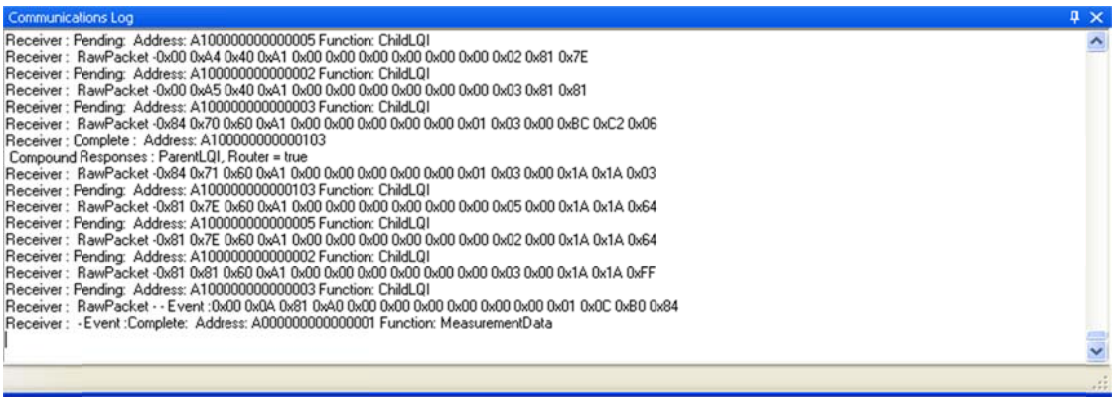
Communications Log

The CMS can keep a log of all communications on the network. This can be helpful in finding faults or diagnosing network problems.

By default, the communications log is enabled. If you want to disable this feature,

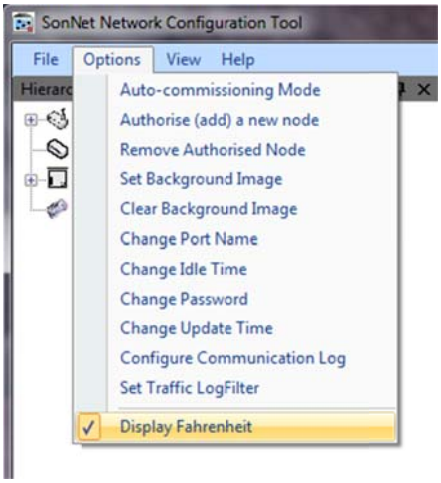
From the menu bar, click on <Options> and then select <Configure Communication Log> from the drop-down menu. Remove the tick from the <Enable Communication Log> box. Click <OK> to submit the change, or click <Cancel> to discard the change.

To view the communications log, from the menu bar choose <View> then <Communications Log>. A window will appear at the bottom of the main CMS window. To close this view, click the cross in the top right of the communications log window.


Communications Log
Receiver : Pending: Address: A100000000000005 Function: ChildLQI
Receiver : RawPacket -0x00 0xA4 0x40 0xA1 0x00 0x00 0x00 0x00 0x00 0x00 0x02 0x81 0x7E
Receiver : Pending: Address: A100000000000002 Function: ChildLQI
Receiver : RawPacket -0x00 0xA5 0x40 0xA1 0x00 0x00 0x00 0x00 0x00 0x00 0x03 0x81 0x81
Receiver : Pending: Address: A100000000000003 Function: ChildLQI
Receiver : RawPacket -0x84 0x70 0x60 0xA1 0x00 0x00 0x00 0x00 0x00 0x01 0x03 0x00 0xBC 0xC2 0x06
Receiver : Complete : Address: A100000000000103
Compound Responses : ParentLQI, Router = true
Receiver : RawPacket -0x84 0x71 0x60 0xA1 0x00 0x00 0x00 0x00 0x00 0x01 0x03 0x00 0x1A 0x1A 0x03
Receiver : Pending: Address: A100000000000103 Function: ChildLQI
Receiver : RawPacket -0x81 0x7E 0x60 0xA1 0x00 0x00 0x00 0x00 0x00 0x00 0x05 0x00 0x1A 0x1A 0x64
Receiver : Pending: Address: A100000000000005 Function: ChildLQI
Receiver : RawPacket -0x81 0x7E 0x60 0xA1 0x00 0x00 0x00 0x00 0x00 0x00 0x02 0x00 0x1A 0x1A 0x64
Receiver : Pending: Address: A100000000000002 Function: ChildLQI
Receiver : RawPacket -0x81 0x81 0x60 0xA1 0x00 0x00 0x00 0x00 0x00 0x00 0x03 0x00 0x1A 0x1A 0xFF
Receiver : Pending: Address: A100000000000003 Function: ChildLQI
Receiver : RawPacket - - Event :0x00 0x0A 0x81 0xA0 0x00 0x00 0x00 0x00 0x00 0x00 0x01 0x0C 0xB0 0x84
Receiver : -Event :Complete: Address: A000000000000001 Function: MeasurementData

Changing Display Units

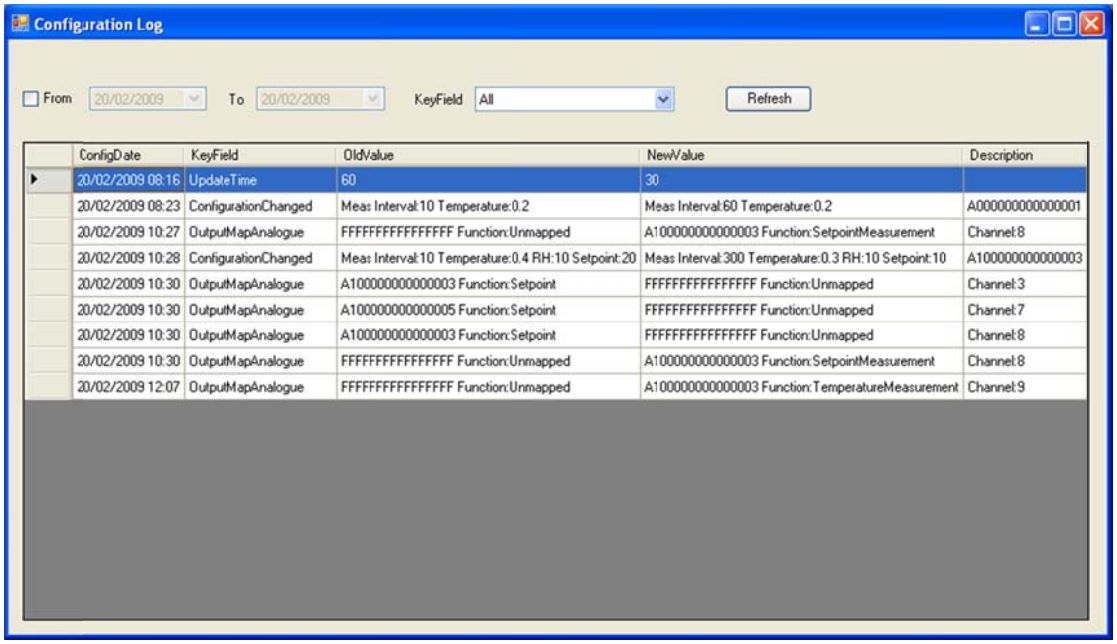
To display temperatures in °F instead of °C, click on <Options> then tick <Display Fahrenheit>.



This change affects mouse-over temperature values, significant change limit values, temperature values shown in the hierarchical text display and print preview.

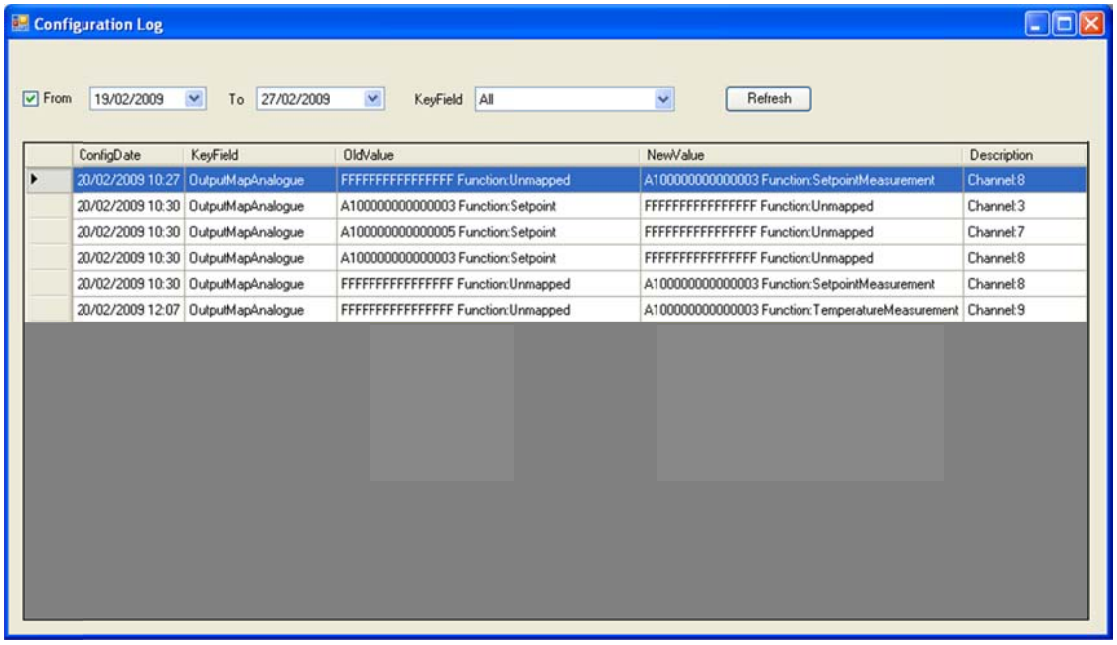
Configuration Log

The configuration log allows the user to view a concise list of any changes made to the configuration of devices. To view the communications log, from the menu bar choose <View> then <Configuration Log>.


Configuration Log
From 20/02/2009 To 20/02/2009 KeyField All Refresh
ConfigDate KeyField OldValue NewValue Description
20/02/2009 08:16 UpdateTime 60 30
20/02/2009 08:23 ConfigurationChanged Meas Interval:10 Temperature:0.2 Meas Interval:60 Temperature:0.2 A000000000000001
20/02/2009 10:27 OutputMapAnalogue FFFFFFFFFFFFFFF Function:Unmapped A100000000000003 Function:SetpointMeasurement Channel:8
20/02/2009 10:28 ConfigurationChanged Meas Interval:10 Temperature:0.4 RH:10 Setpoint:20 Meas Interval:300 Temperature:0.3 RH:10 Setpoint:10 A100000000000003
20/02/2009 10:30 OutputMapAnalogue A100000000000003 Function:Setpoint FFFFFFFFFFFFFFF Function:Unmapped Channel:3
20/02/2009 10:30 OutputMapAnalogue A100000000000005 Function:Setpoint FFFFFFFFFFFFFFF Function:Unmapped Channel:7
20/02/2009 10:30 OutputMapAnalogue A100000000000003 Function:Setpoint FFFFFFFFFFFFFFF Function:Unmapped Channel:8
20/02/2009 10:30 OutputMapAnalogue FFFFFFFFFFFFFFF Function:Unmapped A100000000000003 Function:SetpointMeasurement Channel:8
20/02/2009 12:07 OutputMapAnalogue FFFFFFFFFFFFFFF Function:Unmapped A100000000000003 Function:TemperatureMeasurement Channel:9

Results shown can be filtered to show only specific “key fields” such as when a configuration was changed, or analogue output mappings.

Results can also be filtered within a user-definable date range.


Configuration Log
From 19/02/2009 To 27/02/2009 KeyField All Refresh
ConfigDate KeyField OldValue NewValue Description
20/02/2009 10:27 OutputMapAnalogue FFFFFFFFFFFFFFF Function:Unmapped A100000000000003 Function:SetpointMeasurement Channel:8
20/02/2009 10:30 OutputMapAnalogue A100000000000003 Function:Setpoint FFFFFFFFFFFFFFF Function:Unmapped Channel:3
20/02/2009 10:30 OutputMapAnalogue A100000000000005 Function:Setpoint FFFFFFFFFFFFFFF Function:Unmapped Channel:7
20/02/2009 10:30 OutputMapAnalogue A100000000000003 Function:Setpoint FFFFFFFFFFFFFFF Function:Unmapped Channel:8
20/02/2009 10:30 OutputMapAnalogue FFFFFFFFFFFFFFF Function:Unmapped A100000000000003 Function:SetpointMeasurement Channel:8
20/02/2009 12:07 OutputMapAnalogue FFFFFFFFFFFFFFF Function:Unmapped A100000000000003 Function:TemperatureMeasurement Channel:9

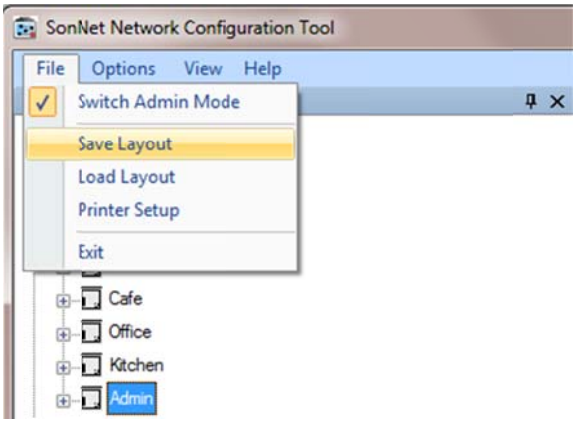
Using CMS to Document a Wireless Network

Saving and Opening Layouts

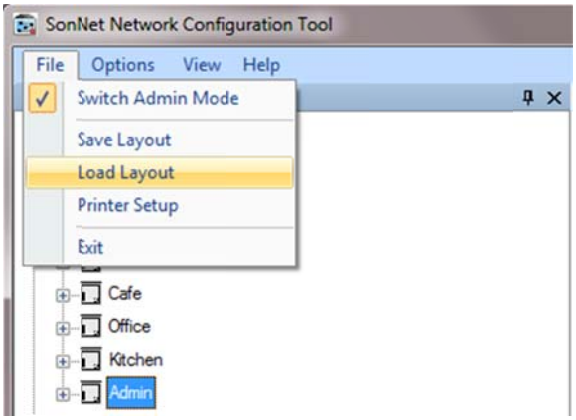
When a network is commissioned, it is very useful to save the graphical map layout to use as a reference and as the basis for comparison when checking the current status of network topology.

Saving a layout records the backdrop (if used) and the position and size of each device icon on the map display.

To save a layout, click on <File> then <Save Layout>



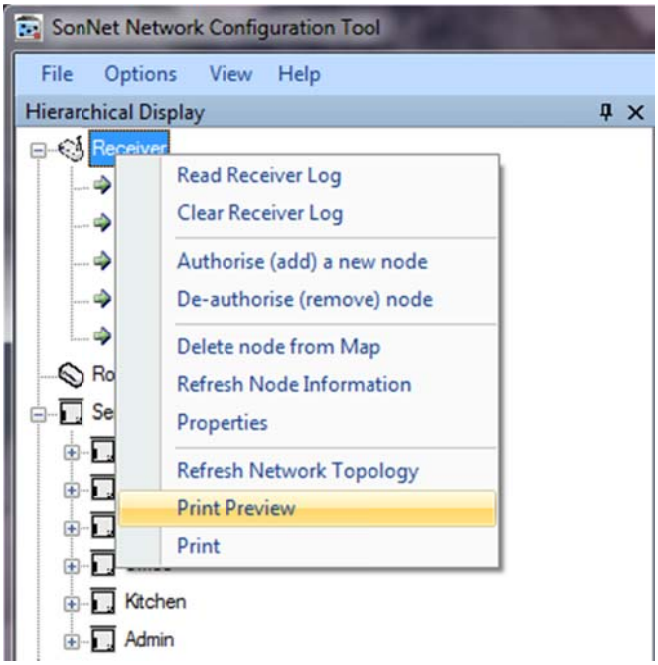
To open a saved layout, click on <File> then <Load Layout>



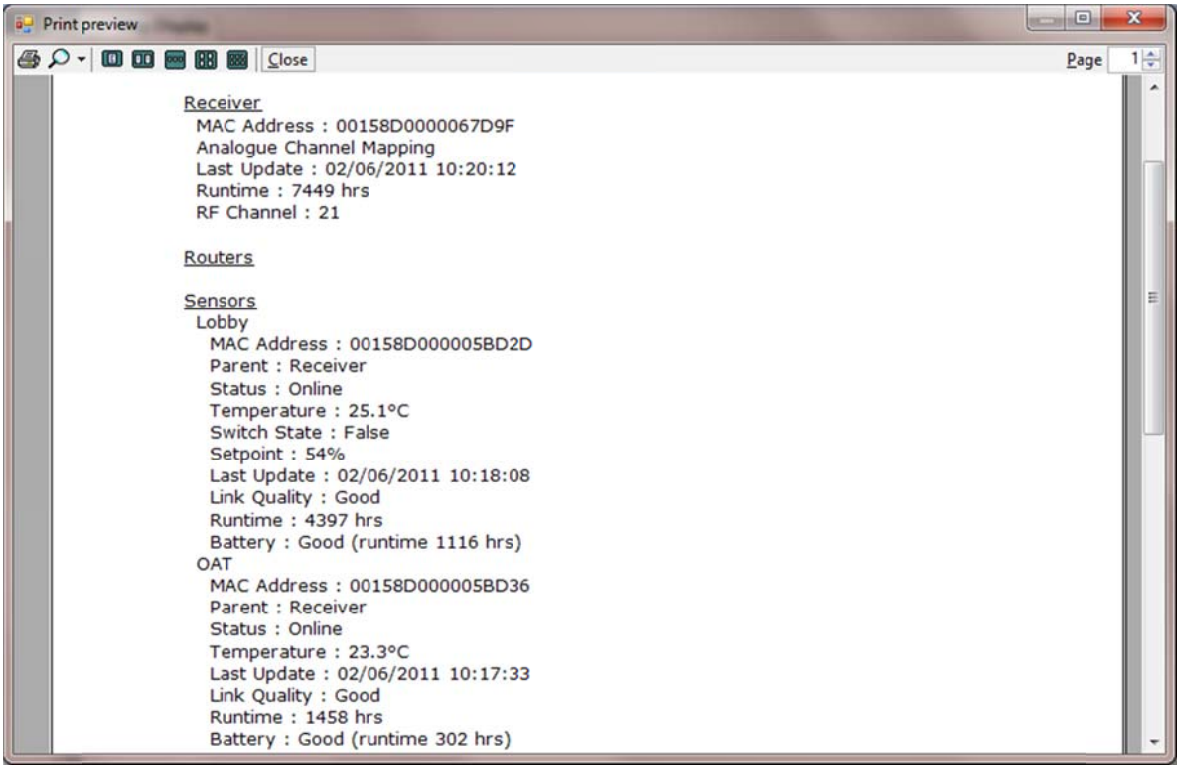
A library of site layouts can be formed as a reference.

Receiver Print Preview

To generate a comprehensive text document of network devices, from the hierarchical display, right-click on the receiver object, and from the menu select <Print Preview>.

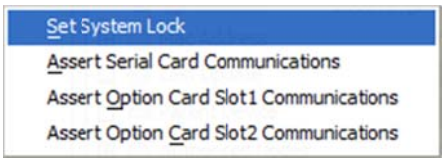


A document is automatically generated, which can be printed on paper for an O&M manual, or to .PDF file, for example.



SonNet-Tridium JACE Driver Action Menus

Network Action Menu


Set System Lock
Assert Serial Card Communications
Assert Option Card Slot1 Communications
Assert Option Card Slot2 Communications

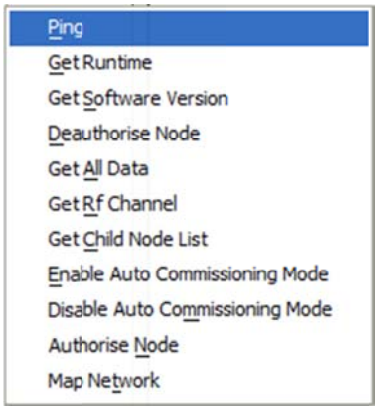
i. Set System Lock – This command determines whether the driver can only find nodes if the receiver is placed in auto-commissioning mode
   a. FALSE = The driver will find nodes already commissioned to a receiver (for example, by Sontay CMS) *without* having to put the receiver into auto commissioning mode.
   b. TRUE = The driver will **not** find nodes already commissioned to a receiver (for example, by Sontay CMS) without having to put the receiver into auto commissioning mode.

ii. Assert Serial Card Communications – This command automatically sets up serial communications parameters for the **RF-RXS** receiver

iii. Assert Option Card Slot1 Communications – This command automatically sets up serial communications parameters for the **RF-RXS-N** option card receiver connected to slot 1 on the JACE (COM3)

iv. Assert Option Card Slot2 Communications – This command automatically sets up serial communications parameters for the **RF-RXS-N** option card receiver connected to slot 2 on the JACE (COM4)

Receiver Action Menu



i. Ping – This command requests the receiver runtime, as a method on checking comms, but doesn't update the receiver runtime field

ii. Get Runtime – This command requests the receiver runtime and updates the receiver runtime field

iii. Get Software Version – This command gets the major and minor versions of the receiver firmware and stores the result as properties

iv. De-authorise Node – This command de-authorises and removes the receiver from the network (**NB** Only works when auto commissioning is **off**)

v. Get All Data – This command refreshes all data, excluding the "parent" property

vi. Get RF Channel – This command gets the current 2.4GHz RF channel (valid channels are 11 – 26 inclusive)

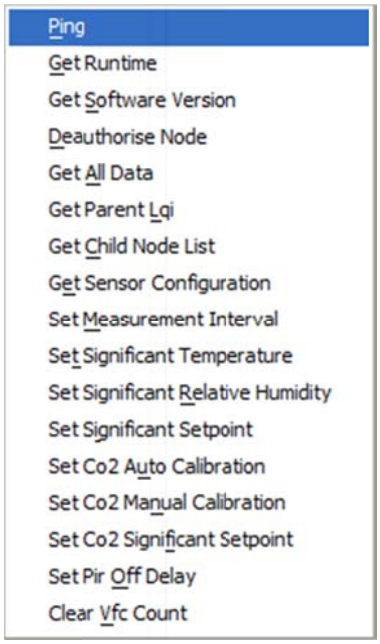
vii. Enable Auto Commissioning Mode – This command sends a request to enable auto commissioning

viii. Disable Auto Commissioning Mode – This command sends a request to disable auto commissioning

ix. Authorise Node – This command is used to manually authorise a node or nodes (as opposed to using auto commissioning)

x. Map Network – This command is used to discover and update the parent node of all devices on the network

Router Action Menu



i. Ping – This command requests the router runtime, as a method on checking comms, but doesn't update the router's runtime field
ii. Get Runtime – This command requests the router's runtime and updates the runtime field
iii. Get Software Version – This command gets the major and minor versions of the router firmware and stores the result as properties
iv. De-authorise Node – This command de-authorises and removes the router from the network (**NB** Only works when auto commissioning is **off**)
v. Get All Data – This command refreshes all the data specific to the selected router, excluding "parent" property
vi. Get Parent LQI – This command gets radio link strength (LQI = Link Quality Index) to the node's parent
vii. Get Sensor Configuration – This command requests the following configuration properties;
    a. Has Temp – Whether the node has a temperature sensor fitted
    b. Has RH – Whether the node has an RH sensor fitted
    c. Has Setpoint – Whether the node has a setpoint adjustment pot fitted
    d. Has Switch – Whether the node has a momentary switch fitted
    e. Meas Interval – The time between transmission of measurement values
    f. Sig Temp – The significant change in temperature which results in the measured value being transmitted immediately
    g. Sig RH – The significant change in RH which results in the measured value being transmitted immediately
    h. Sig Setpoint – The significant change in setpoint which results in the measured value being transmitted immediately
viii. Set Measurement Interval – This command sets the normal time between transmission of measurement values ***[Limits: 10 to 900 seconds]***
ix. Set Significant Temperature – This command sets the significant change in temperature which results in the measured value being transmitted immediately ***[Limits: 0.1°C to 1.0°C]***
x. Set Significant RH – This command sets the significant change in RH which results in the measured value being transmitted immediately ***[Limits: 3% to 10%]***
xi. Set Significant Setpoint – This command sets the significant change in setpoint which results in the measured value being transmitted immediately ***[Limits: 1% to 25%]***

xii. Set CO2 Auto Calibration – This command enables automatic baseline calibration (ABC) for the CO2 sensor element. Over a period of 24 hours, the sensor system records CO2 levels, and once per 24 hours, the lowest level (which is assumed to be during a period of no occupancy) is used to calibrate the sensor output at 400ppm.

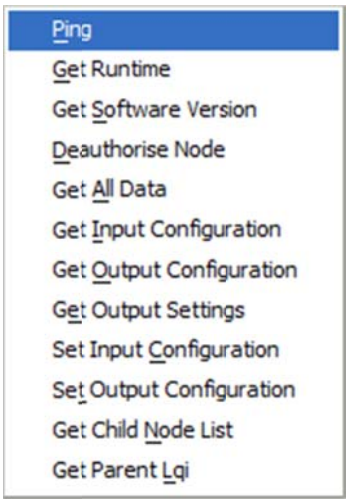
xiii. Set CO2 Manual Calibration – This command performs a manual calibration of the CO2 sensor. Ensure ambient CO2 is at 400ppm before performing this command.

xiv. Set CO2 Significant Setpoint – This command sets the significant change in CO2 which results in the measured value being transmitted immediately ***[Limits: 100ppm to 800ppm, 20ppm steps, default = 400ppm]***

xv. Set PIR Off Delay – This command sets the off delay, which starts counting when the PIR element detects no occupancy. ***[Limits: 10 seconds to 30 minutes, 10 second steps steps, default = 30 seconds]***

xvi. Clear VFC Count – This command clears the VFC input counter. *See also The VFC Activation count Point on page 66.*

RF-IOM Action Menu



i. Ping – This command requests the RF-IOM runtime, as a method on checking comms, but doesn't update the RF-IOM's runtime field

ii. Get Runtime – This command requests the RF-IOM's runtime and updates the runtime field

iii. Get Software Version – This command gets the major and minor versions of the RF-IOM firmware and stores the result as properties

iv. De-authorise Node – This command de-authorises and removes the RF-IOM from the network (**NB** Only works when auto commissioning is **off**)

v. Get All Data – This command refreshes all the data specific to the selected router, excluding "parent" property

vi. Get Input Configuration – This command refreshes all the data specific to the RF-IOM input configuration

vii. Get Output Configuration – This command refreshes all the data specific to the RF-IOM output configuration

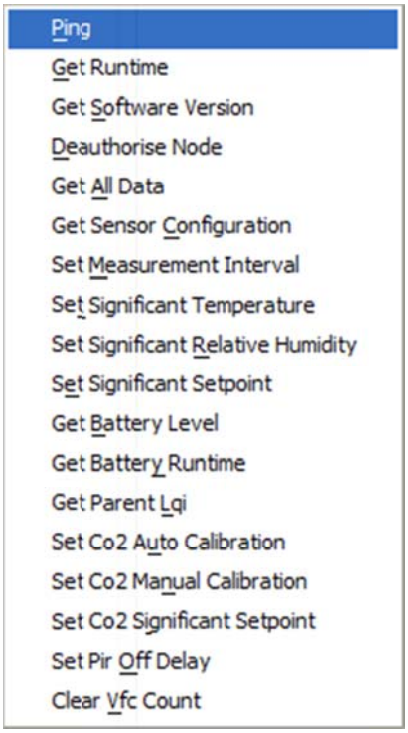
viii. Set Input Configuration – This command sends any changes made to the RF-IOM input configuration

ix. Set Output Configuration – This command sends any changes made to the RF-IOM output configuration

x. Get Child Node List – This command gets radio link strength (LQI = Link Quality Index) to the node's parent

xi. Get Parent LQI – This command gets radio link strength (LQI = Link Quality Index) to the node's parent

Sensor Action Menu



i. Ping – This command requests the ED's runtime, as a method on checking comms, but doesn't update the router's runtime field
ii. Get Runtime – This command requests the ED's runtime and updates the runtime field
iii. Get Software Version – This command gets the major and minor version of the ED's firmware and stores the result as properties
iv. De-authorise Node – This command de-authorises and removes the ED (**NB** Only works when auto commissioning is **off**)
v. Get All Data – This command refreshes all the data specific to the selected ED, excluding "parent" property
vi. Get Sensor Configuration – This command requests the following configuration properties;
    a. Has Temp – Whether the node has a temperature sensor fitted
    b. Has RH – Whether the node has an RH sensor fitted
    c. Has Setpoint – Whether the node has a setpoint adjustment pot fitted
    d. Has Switch – Whether the node has a momentary switch fitted
    e. Meas Interval – The time between transmission of measurement values
    f. Sig Temp – The significant change in temperature which results in the measured value being transmitted immediately
    g. Sig RH – The significant change in RH which results in the measured value being transmitted immediately
    h. Sig Setpoint – The significant change in setpoint which results in the measured value being transmitted immediately
vii. Set Measurement Interval – This command sets the normal time between transmission of measurement values ***[Limits: 10 to 900 seconds]***
viii. Set Significant Temperature – This command sets the significant change in temperature which results in the measured value being transmitted immediately ***[Limits: 0.1°C to 1.0°C]***
ix. Set Significant RH – This command sets the significant change in RH which results in the measured value being transmitted immediately ***[Limits: 3% to 10%]***
x. Set Significant Setpoint – This command sets the significant change in setpoint which results in the measured value being transmitted immediately ***[Limits: 1% to 25%]***

xi. Get Battery Level – This command requests the battery status
xii. Get Battery Runtime – This command requests the ED's battery runtime
xiii. Get Parent LQI – This command get link strength (LQI = Link Quality Index) to the node's parent
xiv. Set CO2 Auto Calibration – This command enables automatic baseline calibration (ABC) for the CO2 sensor element. Over a period of 24 hours, the sensor system records CO2 levels, and once per 24 hours, the lowest level (which is assumed to be during a period of no occupancy) is used to calibrate the sensor output at 400ppm.
xv. Set CO2 Manual Calibration – This command performs a manual calibration of the CO2 sensor. Ensure ambient CO2 is at 400ppm before performing this command.
xvi. Set CO2 Significant Setpoint – This command sets the significant change in CO2 which results in the measured value being transmitted immediately ***[Limits: 100ppm to 800ppm, 20ppm steps, default = 400ppm]***
xvii. Set PIR Off Delay – This command sets the off delay, which starts counting when the PIR element detects no occupancy. ***[Limits: 10 seconds to 30 minutes, 10 second steps steps, default = 30 seconds]***
xviii. Clear VFC Count – This command clears the VFC input counter. *See also The VFC Activation count Point on page 66.*

Managing a Tridium JACE SonNet Wireless Network

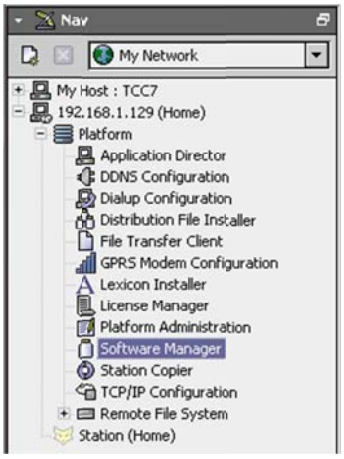
Requirements

1. Tridium JACE 2xx series or 6xx series
2. Niagara AX Workbench
   a. **RF-RXS** - V3.5.34 or later
   b. **RF-RXS-N** - V3.6.43 or later

Installing the SonNet Driver to a Tridium JACE

If not pre-installed, download a copy the SonNet driver file "sonnet.jar" from www.sontay.com and copy it to the <Modules> folder on the PC running Niagara Workbench. For example;

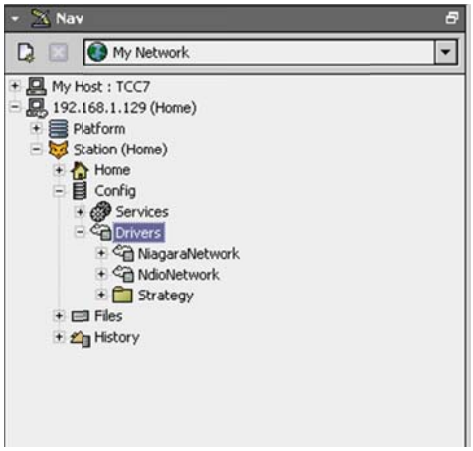
<C:\Niagara\Niagara-3.5.34\modules>



1. Start Niagara Workbench and log into the JACE platform
2. From the platform tree, open <Software Manager>

File	Installed Version	Avail. Version	
rdb	-	Tridium 3.6.36	Not Installed
rdbDb2	-	Tridium 3.6.36	Not Installed
rdbHsqlDb	-	Tridium 3.6.36	Not Installed
rdbMySQL	-	Tridium 3.6.36	Not Installed
rdbOracle	-	Tridium 3.6.36	Not Installed
rdbSqlServer	-	Tridium 3.6.36	Not Installed
remoteVideo	-	Tridium 3.6.36	Not Installed
report	-	Tridium 3.6.36	Not Installed
sedonaInstaller	-	Tridium 3.6.36	Not Installed
silk	-	Tridium 3.6.36	Not Installed
smartTablehx	-	Tridium 3.6.36	Not Installed
sms	-	Tridium 3.6.36	Not Installed
snmp	-	Tridium 3.6.36	Not Installed
sonnet	-	Sontay 13.14	Install Sontay 13.14
test	-	Tridium 3.6.36	Not Installed
timesync	-	Tridium 3.6.36	Not Installed
tls	-	Tridium 3.6.36	Not Installed
tomcat	-	Tridium 3.6.36	Not Installed
touchscreen	-	Tridium 3.6.36	Not Installed
tunnel	-	Tridium 3.6.36	Not Installed
usbmon	-	Tridium 3.6.36	Not Installed
videoDriver	-	Tridium 3.6.36	Not Installed
weather	-	Tridium 3.6.36	Not Installed
zwave	-	Tridium 3.6.36	Not Installed

3. From the list of modules and drivers, locate and select <sonnet>
4. Click the <Commit> button. The driver will be installed. **NB** - this action will cause the JACE to reboot.
5. After the JACE has rebooted, log into the JACE station. Expand the station tree and expand the <Config> branch to show the <Drivers> branch.



Adding a SonNet Network

Prerequisites:

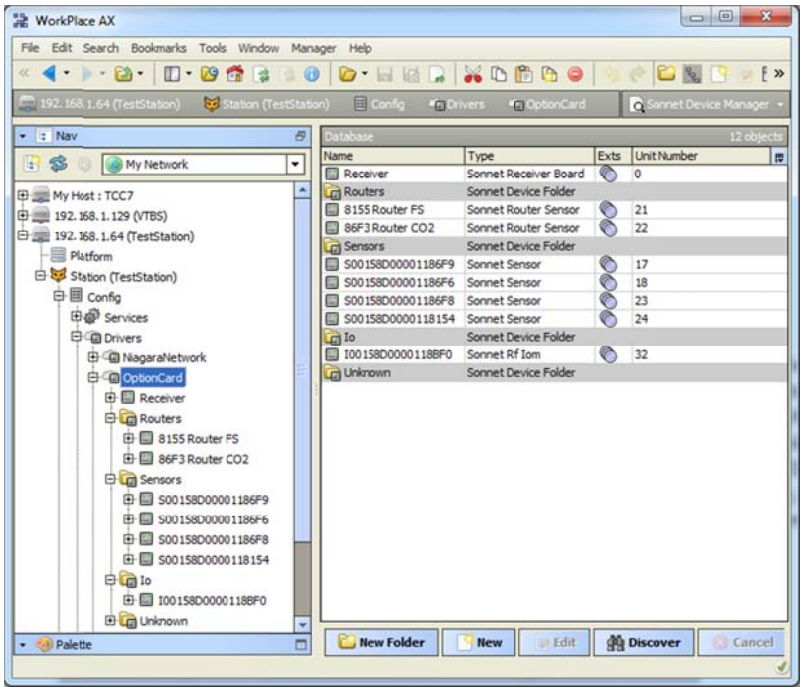
- The **RF-RXS** must be connected to COM1 of the JACE by a serial cable (9-pin D male to 9-pin D female). Do not use a null modem serial cable.
  - ***NB The RS-232 port of the RF-RXS will not communicate if the USB port on the RF-RXS is connected.***
- The **RF-RXS-N** should be installed in either Slot1 (COM3) or Slot2 (COM4) of the JACE. See "Installing the SonNet option card"
- Observing power supply polarity, switch on the **RF-RXS**, or power up the JACE with the option card fitted.
  - Observe the red network LED. If it is blinking on and off it means the receiver has no child devices yet, if it is on steadily then the receiver already has at least one child node.

1. Double-click the <Drivers> folder in the <Station\Config > navigation tree to open the Driver Manager window. Click the <New> button.
2. From the <Type to Add> drop-down box, scroll down and select <SonNet Network>
3. Click the <OK> button, ensure the new driver is enabled and then click the <OK> button to add the network driver.
   a. At this point, the new SonNet network may be shown in orange in the Driver Manager window.
4. To set the default communications parameters for the receiver, right-click on the <SonNetNetwork> folder in the <Station\Config\Drivers> navigation tree, then select <Actions>

Set System Lock
Assert Serial Card Communications
Assert Option Card Slot1 Communications
Assert Option Card Slot2 Communications

The Network System right-click <Action> menu

   a. If an **RF-RXS** serial receiver is being used, select <Assert Serial Card Communications>
   b. If an **RF-RXS-N** option card receiver is being used, select <Assert Option Card Slot1 Communications> or <Assert Option Card Slot2 Communications>, depending on which option card slot is used.



When the communications parameters have been set, the new SonNet network should look similar to this. In the SonNet Device Manager window, the receiver should be shown in white.

The default folders “Receiver”, “Routers”, “Sensors” and “Unknown” are created automatically. Note that the “Discover” button has no functionality in the SonNet Device Manager.

The new SonNet network is now ready for commissioning.

Commissioning a SonNet Network

A SonNet network can be commissioned in 2 ways using the JACE driver;

1. An existing network, where the receiver already has child nodes joined to the receiver (for example, where the network has been commissioned using CMS or the receiver has been moved from one JACE to another)
2. A completely new network, where the receiver has no child nodes

Commissioning an Existing Network

To commission an existing network, where routers and sensor end devices (EDs) have already joined the receiver’s network, requires very little management.

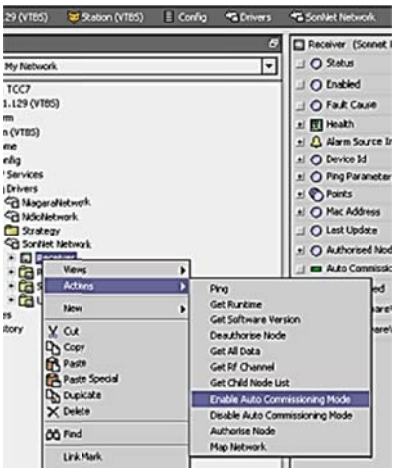
1. Right-click on the <SonNetNetwork> folder in the <Station\Config\Drivers> navigation tree, select <Actions> then <Set System Lock>
2. Using the drop-down list, select “False” and then click OK.

The existing network devices will appear in their respective folders. This may take several minutes to complete.

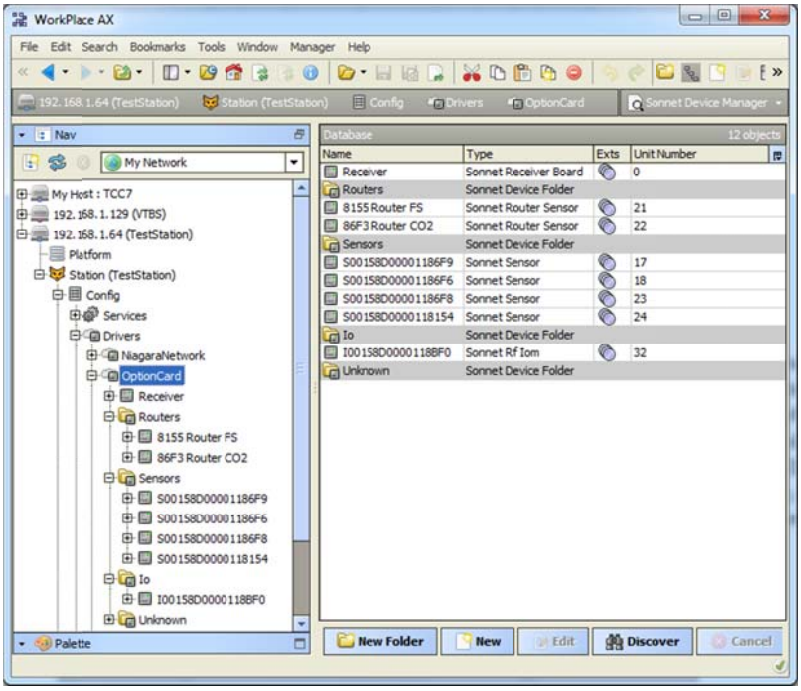
It is recommended that when all existing nodes have appeared in the driver, the System Lock property be set to True.

Commissioning a New Network

To commission a new network, where no routers and sensor end devices (EDs) are present on the receiver's network, or to add new devices to an existing network.



1. Right-click on the <Receiver> folder in the <Station\Config\Drivers\SonNetNetwork> navigation tree, select <Actions> then <Enable Auto Commissioning Mode>
2. Power up routers and EDs as required (see "Commissioning A SonNet System: Step-By-Step", pages 68 - 69)
3. NB While the receiver is in auto commissioning mode it is important NOT to use other <Action> menu functions. Wait until all devices have joined the network.
4. Right-click on the <Receiver> folder in the <Station\Config\Drivers\SonNetNetwork> navigation tree, select <Actions> then <Disable Auto Commissioning Mode>



The new network devices will appear in their respective folders.

This may take several minutes to complete.

Configuring Network Devices

Device Prefixes**:**

When SonNet devices are first shown in the nav tree or the device's property page, they have default names which take the format of a prefix followed by the MAC address of the device.

Each prefix denotes a specific type of device:

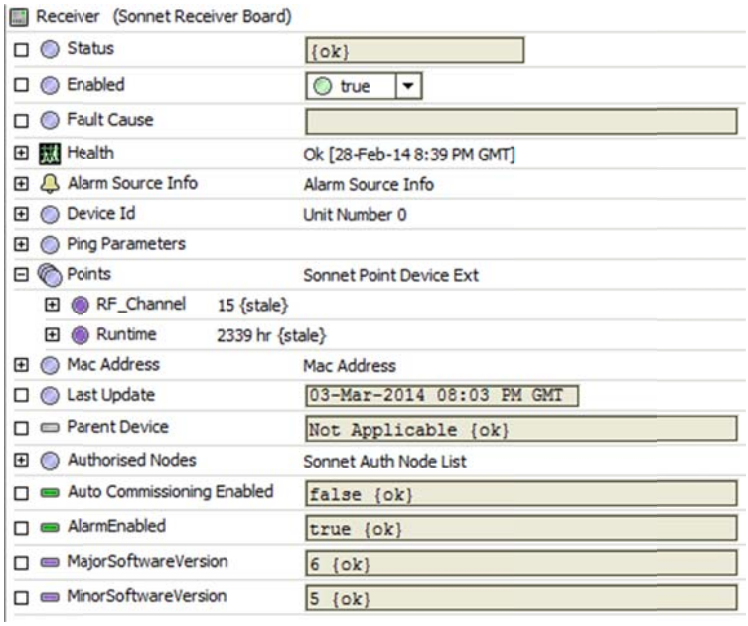
- "U" denotes that the device is *unknown* (i.e. the receiver doesn't have full information yet for the device)
- "S" denotes that the device is a battery powered end device (ED)
- "IO" denotes that the device is an RF-IOM
- "R" denotes that the device is a router *without sensing capabilities*
- "X" denotes that the device is a router *with sensing capabilities*

There is no prefix for the receiver name.

NB It is strongly recommended that the device name is kept as the default name. A user friendly *display name* can be configured for each device. To set a display name, right-click on the device and select "Set Display Name" from the menu.

Receiver

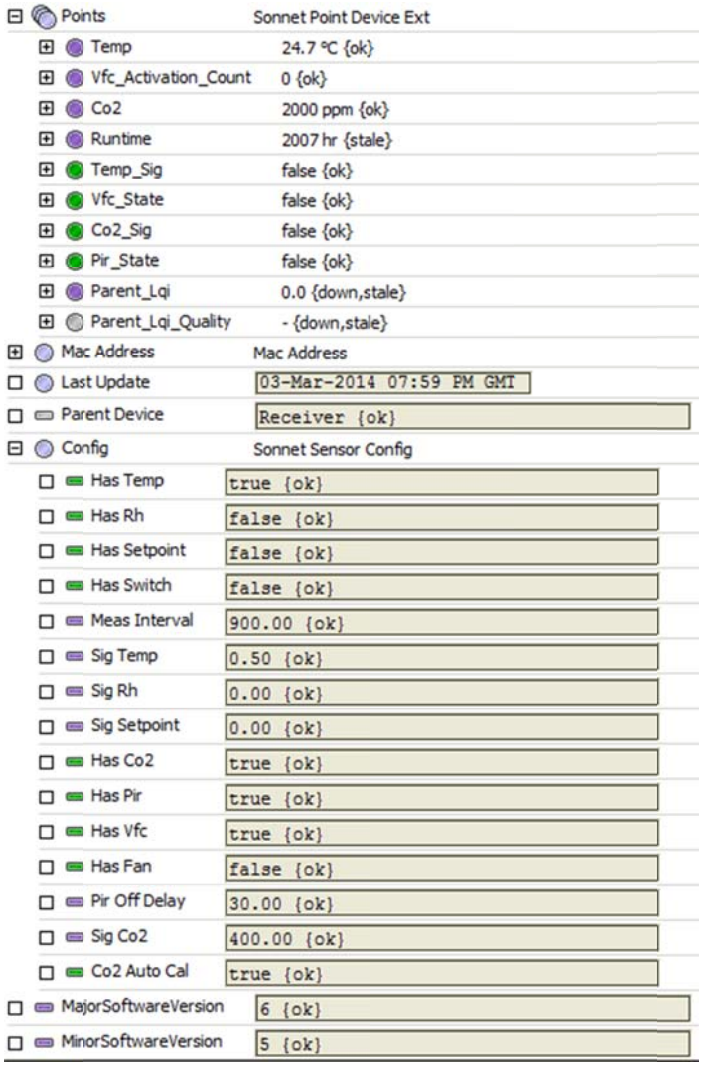
1. Right-click on the <Receiver> folder in the <Station\Config\Drivers\SonNetNetwork> navigation tree, select <Views> then <Property Sheet>
2. Right-click on the <Receiver> folder in the <Station\Config\Drivers\SonNetNetwork> navigation tree, select <Actions> then <Get All Data>
3. Note that software version numbers, RF channel and receiver runtime are now all displayed.
4. **NB** After a period of time, the RF channel and receiver runtime values will be displayed as *stale*. This is normal, as these values are not updated unless requested.
5. Note the status, last fault cause and last update times.
6. Note the status of the auto commissioning feature.


Receiver (Sonnet Receiver Board)
Status {ok}
Enabled true
Fault Cause
Health Ok [28-Feb-14 8:39 PM GMT]
Alarm Source Info Alarm Source Info
Device Id Unit Number 0
Ping Parameters
Points Sonnet Point Device Ext
RF_Channel 15 {stale}
Runtime 2339 hr {stale}
Mac Address Mac Address
Last Update 03-Mar-2014 08:03 PM GMT
Parent Device Not Applicable {ok}
Authorised Nodes Sonnet Auth Node List
Auto Commissioning Enabled false {ok}
AlarmEnabled true {ok}
MajorSoftwareVersion 6 {ok}
MinorSoftwareVersion 5 {ok}

The Receiver Property Page

Routers

1. Expand the <Routers> folder in the <Station\Config\Drivers\SonNetNetwork> navigation tree, select a router from the list, select <Views> then <Property Sheet>.
2. Ensure the receiver is **NOT** in auto commissioning mode.
3. Right-click on the router and select <Actions> then <Get All Data>



A typical router's property page

1. Note that software version numbers and runtime are now all displayed.
2. **NB** After a period of time, all values apart from measured values (such as temperature) will be displayed as *stale*. This is normal, as only measured values are updated unless requested.
3. Note the status, last fault cause and last update times.
4. Note the parent of the router.
5. Note the parent LQI values

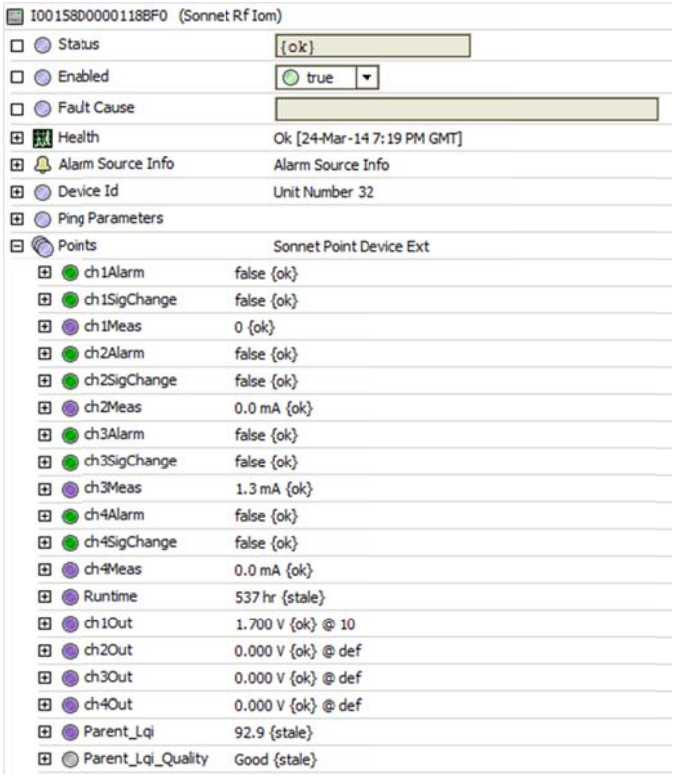
NB When a request for data is made to a router, the request should be processed quickly, as the routers are permanently "awake". However, the exact response period will depend on how many routers (if any) the request and reply have to pass through. Normally, the response is within 30 seconds maximum.

All the router's "points", such as "Temp" for the measured temperature value, have default names. It is strongly recommended that point names are kept as the default names. A user friendly *display name* can be configured for each point. To set a display name, right-click on the point in either the nav tree or the device's property sheet and select "Set Display Name" from the menu.

To make changes to the router's Config properties, refer to the Router Actions Menu on page 52.

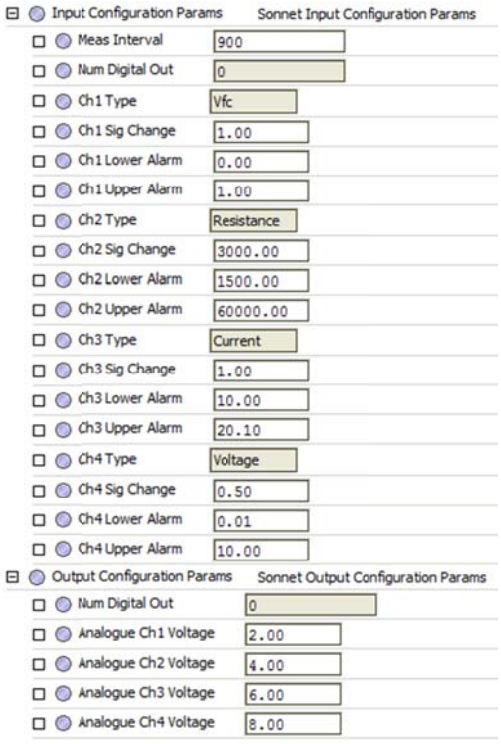
RF-IOMs

1. Expand the <Io> folder in the <Station\Config\Drivers\SonNetNetwork> navigation tree, select an RF-IOM from the list, select <Views> then <Property Sheet>.
2. Ensure the receiver is **NOT** in auto commissioning mode.
3. Right-click on an RF-IOM and select <Actions> then <Get All Data>



A typical RF-IOM's property page, showing the points expanded.

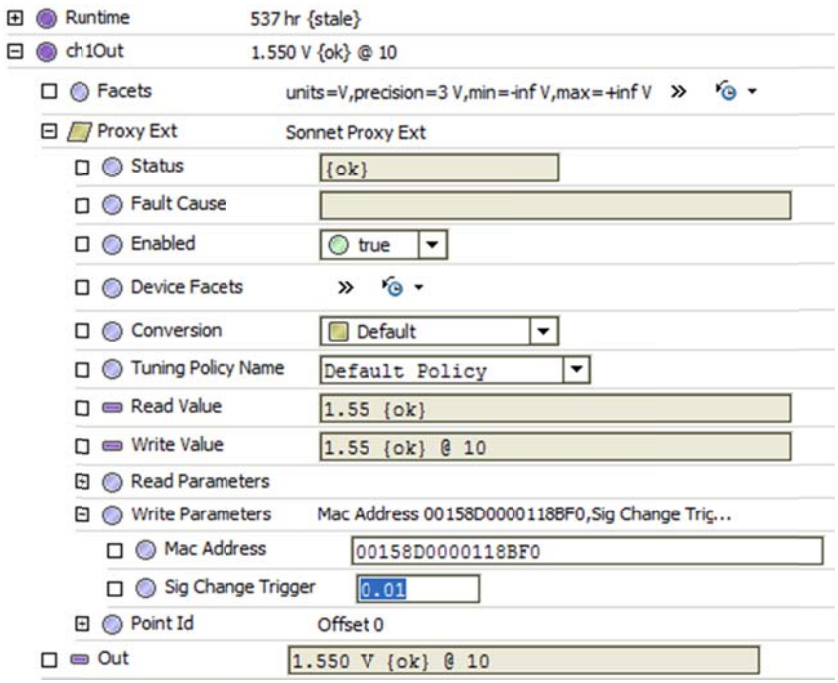
1. Note that software version numbers and runtime are now all displayed.
2. **NB** After a period of time, all values apart from measured values (such as temperature) will be displayed as *stale*. This is normal, as only measured values are updated unless requested.
3. Note the status, last fault cause and last update times.
4. Note the parent of the RF-IOM.
5. Note the parent LQI values


Input Configuration Params Sonnet Input Configuration Params
Meas Interval 900
Num Digital Out 0
Ch1 Type Vfc
Ch1 Sig Change 1.00
Ch1 Lower Alarm 0.00
Ch1 Upper Alarm 1.00
Ch2 Type Resistance
Ch2 Sig Change 3000.00
Ch2 Lower Alarm 1500.00
Ch2 Upper Alarm 60000.00
Ch3 Type Current
Ch3 Sig Change 1.00
Ch3 Lower Alarm 10.00
Ch3 Upper Alarm 20.10
Ch4 Type Voltage
Ch4 Sig Change 0.50
Ch4 Lower Alarm 0.01
Ch4 Upper Alarm 10.00
Output Configuration Params Sonnet Output Configuration Params
Num Digital Out 0
Analogue Ch1 Voltage 2.00
Analogue Ch2 Voltage 4.00
Analogue Ch3 Voltage 6.00
Analogue Ch4 Voltage 8.00

A typical RF-IOM's property page, showing the input and output configuration parameters expanded.

1. Note the measurement interval. This pertains to input measurements only
2. The output configuration parameters are for the output fallback values. These are written to the output channels in the event that the RF-IOM goes offline.
3. Note the input channel Types – these reflect the input jumper settings. **NB** – it is important NOT to change the inout jumpers while the RF-IOM is powered.
4. Note the low and high alarm levels for each input channel.
5. To set a new measurement interval, enter the required level in the appropriate box.
6. To set high alarm, low alarm or COV values, enter the required level in the appropriate box.
7. Notes: The units for alarm levels and COV are dependent on the input type. For example, if an input is set to mA, then the units for COV and alarm levels are also in mA.

Writing Output RF-IOM Values



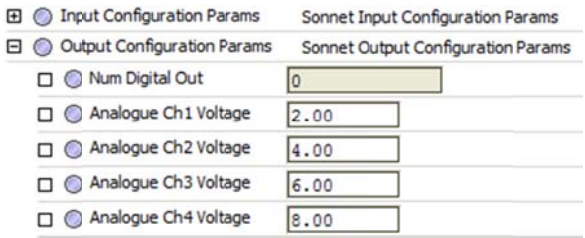
Values for the RF-IOM output channels are written, by default, every 5 minutes. However, like inputs, the outputs can have a significant change value (SCV) set. If the output value changes by more than the SCV, the change is sent immediately. Each output channel can be configured for a different SCV value, down to 10mV steps.

To set the SCV for an output, expand the output channel in the points list, then expand Proxy Extensions, finally expand Write Parameters. Enter the required SCV in the Sig Change Trigger box (highlighted above).

RF-IOM Fallback Values

Fallback values are default values which are written to the RF-IOM output channels in the event that the RF-IOM goes offline (but remains powered). This is a safety mechanism so that plant controlled by the RF-IOM outputs can be set to a “safe” value if the control strategy cannot be updated from the RF-IOM.

To set fallback values for each output, expand the Output Configuration Parameters and enter the required values for each output.



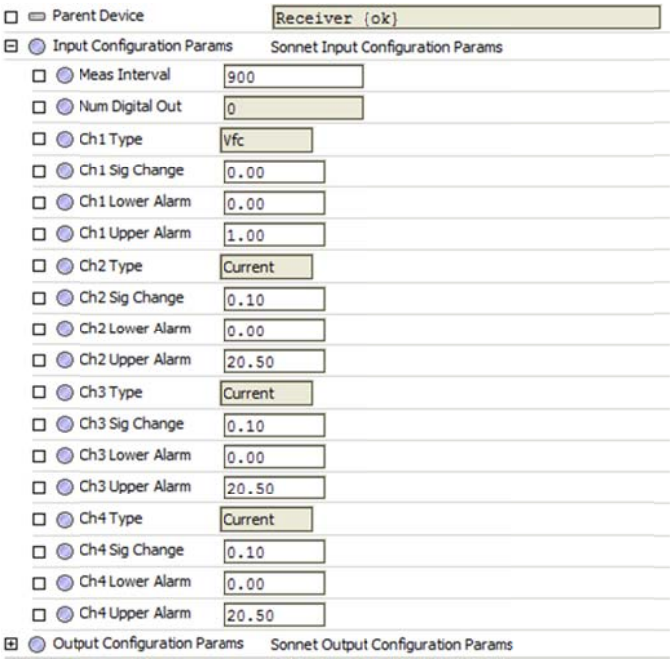
Important!!! After making changes to the fallback values, it is essential to write the new data to the device by right-clicking the RF-IOM and from the Action Menu selecting Set Output Configuration.

RF-IOM Input Configuration

The default measurement interval determines how often the RF-IOM sends it measured input values. The default is 900 seconds. Like EDs, if an input value exceeds a configurable significant change value (SCV), the measured input value will be sent immediately. Each input has its own SCV.

To access input configuration properties, expand the Input Configuration Params section.

High and low alarm levels can also be set for each input.



Note that the alarm levels are in the same units as the input type. So, for example, if Input 1 is set for 0-10Vdc the alarm levels are also in Vdc. Similarly, SCV values are in the same units as the input type.

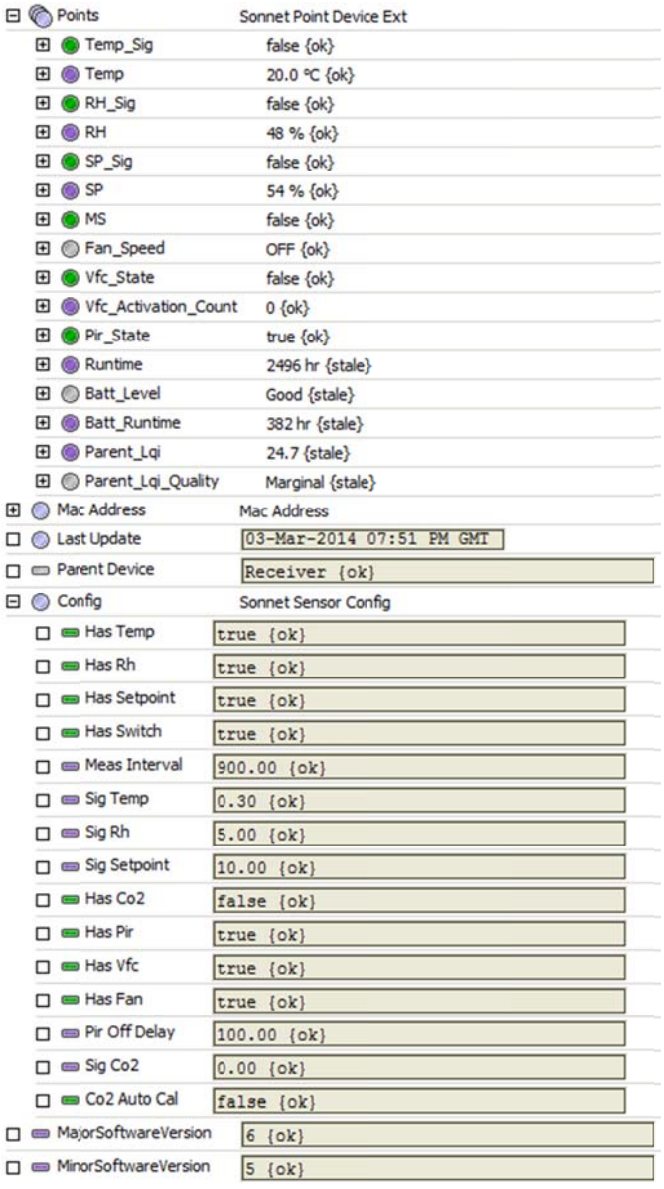
If an input is set as a VFC type, the input value will be either 0 (OFF) or 1 (ON). Changes of input state for a VFC input are sent immediately.

Important!!! After making any changes to the input configuration, it is essential to write the new data to the device by right-clicking the RF-IOM and from the Action Menu selecting Set Input Configuration.

NB – It is strongly recommended that the default measurement interval be left at the default value of 900 seconds to prevent unnecessary radio traffic.

End Devices (EDs)

1. Expand the <Sensors> folder in the <Station\Config\Drivers\SonNetNetwork> navigation tree, select a sensor from the list, select <Views> then <Property Sheet>.
2. Ensure the receiver is **NOT** in auto commissioning mode.
3. Right-click on the sensor and select <Actions> then <Get All Data>A typical EDs property page



1. Note that software version numbers, battery level and runtime and device runtime are now all displayed.
2. **NB** After a period of time, all values apart from measured values (such as temperature) will be displayed as *stale*. This is normal, as only measured values are updated unless requested.
3. Note the status, last fault cause and last update times.
4. Note the parent of the sensor.
5. Note the parent LQI values

NB When a request for data is made to an ED, the request is buffered until the ED "wakes" to take and send its measurements. Because of this, it may take some minutes to retrieve the requested data. The exact period will depend on the measurement interval time (default 900 seconds), how many routers (if any) the request and reply have to pass through and when in that transmission cycle the request is made.

All the sensor's "points", such as "Temp" for the measured temperature value, have default names. It is strongly recommended that point names are kept as the default names. A user friendly *display name* can be configured for each point. To set a display name, right-click on the point in either the nav tree or the device's property sheet and select "Set Display Name" from the menu.

The VFC Activation Count Point

The VFC Activation Count Point can be used as a “backup” to count VFC input True state activations, in the event that the ED or router can carry on counting input pulse even if the ED or router goes offline. When the ED or router comes back online, the VFC counts totalled in strategy can be compared with the total held in the VFC Activation Count Point, to be sure no pulses have been missed while the ED or router has been offline.

The total held in the VFC Activation Count Point can be reset to 0 (see pages 53 and 55).

To make changes to the EDs Config properties, refer to the Sensor Actions Menu on page 54.

Commissioning Multiple Networks on the Same Site

It is quite a common requirement to need to commission several SonNet networks on the same site, for example one per floor in a multi-storey building. To avoid the possibility of SonNet wireless nodes intended for one network appearing on another, 2 commissioning methods are available.

Method 1: Pre-commission each network away from site.

This entails adding routers and EDs in the normal way to a receiver.

- If using an **RF-RXS**, this can be done either by using CMS or with the receiver connected to the RS-232 port of a JACE.
- If using an **RF-RXS-N**, this can only be done with the receiver connected to a JACE option card slot.

1. Using Niagara AX or a web browser, set System Lock property to TRUE
2. Place the receiver into auto-commissioning mode and power up all routers and EDs required on the receiver's network to join.
3. When all devices have joined the network, take the receiver out of auto-commissioning mode.
4. Perform a "get all data" request on all devices
5. Power off all routers and EDs associated with the receiver
6. Power off the receiver
7. Repeat this process for each receiver/network
8. Take all SonNet devices to site and install
9. Power up each receiver in turn together with its associated routers and EDs, and using Niagara AX or a web browser set the System lock property for each network to FALSE
10. All pre-configured routers and EDs will join their respective receivers *without* the need to place any receiver into auto-commissioning mode on site.

Method 2: Commission each network individually on site.

This entails adding routers and EDs in the normal way to a receiver.

- If using an **RF-RXS**, this can be done either by using CMS or with the receiver connected to the RS-232 port of a JACE.
- If using an **RF-RXS-N**, this can only be done with the receiver connected to a JACE option card slot.

1. Using Niagara AX or a web browser, set System Lock to property FALSE
2. Place only one receiver at a time into auto-commissioning mode and power up all routers and EDs required on the receiver's network to join.
3. When all devices have joined the network, take the receiver out of auto-commissioning mode.
4. Perform a "get all data" request on all devices

NB It is important to ensure all receivers NOT being commissioned have auto-commissioning disabled. Nodes which are already commissioned to an existing network must have reliable communications to that network to prevent them looking for other networks to join. Ensure all nodes on a commissioned network have a good link quality index (LQI) to their parents. In extreme cases, it may be prudent to temporarily power off "vulnerable" nodes while commissioning another network nearby.

Commissioning a SonNet System: A Step-By-Step Guide (CMS Method)

1. Mount the receiver using the DIN carrier clip. **NB** - it is extremely important that if the receiver is to be mounted in an enclosed panel (metal or plastic) that an external aerial extension is used. Two are available from Sontay, a 2 metre version **RF-AERIAL-PM2** and a 5 metre version **RF-AERIAL-PM5** (see page 18). If the aerial is to be mounted on top of the receiver panel, the extension bulk head jack should be mounted through a hole (preferably on the top of the panel) and secured in place with the star washer and hex nut. If the aerial is to be mounted remotely, the extension lead should be passed through a protective cable gland on the panel. The connector on the other end of the extension should be screwed hand tight onto the aerial connector located on the receiver PCB. Do NOT over tighten.
2. Fit the receiver aerial to the receiver PCB mounted connector, or if using an aerial extension, to the bulk head jack connector.
3. Ensure, where possible, that the receiver aerial is aligned vertically, and as far away from obstructions as possible.
4. Ensure that the receiver power supply polarity is correct if using a 24Vdc supply.
5. Mount all routers in their appropriate positions, as determined by the site survey. Ensure that the power supply polarity is correct if using a 24Vdc supply.
6. Ensure, where possible, that the router aerials are aligned vertically, and as far away from obstructions as possible.
7. Do NOT switch on the router(s) until all SonNet devices are installed and ready for commissioning.
8. **NB - RF-IOMs have router functionality**. Mount all RF-IOMs in their appropriate positions, as determined by the site survey. Ensure that the power supply polarity is correct if using a 24Vdc supply.
9. Ensure, where possible, that the RF-IOM aerials are aligned vertically, and as far away from obstructions as possible.
10. Do NOT switch on the RF-IOM(s) until all SonNet devices are installed and ready for commissioning.
11. Mount all end devices (EDs) in their appropriate positions.
    a. Ensure that each space housing ED is mounted with the tamperproof screw at the bottom. This ensures the integral PCB aerial is in the correct alignment.
    b. Ensure that each plant housing ED is mounted with the aerials aligned vertically, and as far away from obstructions as possible.
12. Do NOT switch on EDs until the receiver and ALL routers are installed and commissioned.
13. Connect the receiver's USB connector to a laptop or PC with CMS installed.
14. Switch on the receiver. If this is the first time the receiver has been commissioned, note that the red LED near the reset button is flashing. This indicates that the receiver has no child devices on the network.
15. If required, install the 2 drivers required for CMS (see page 25). Windows 7 64-bit users, please see page 21
16. Start CMS by double-clicking the desktop icon. Select the required com port (see page 26). Log on at admin level (see page 29).
17. If required, add a background image to CMS map display (see page 42).
18. Using CMS, ensure that the receiver appears in the hierarchical display. Add to the map display by drag-and-drop.
19. Place the receiver in auto-commissioning mode (see page 30).
20. Referencing the site survey plans, switch on all the routers and RF-IOMs using the PCB jumper, starting with those closest to the receiver (i.e. "layer 1"). Carry on with the next layers of routers and RF-IOMs until all routers and RF-IOMs are switched on.
21. Using CMS, ensure that all the routers appear in the hierarchical display.
    a. Note that initially, the routers and RF-IOMs will be shown in the "Unknown" category in the hierarchical display. This is normal.
    b. Ensure that each router moves to the "Router" category in the hierarchical display. Depending on the number of devices on the network, this may take a couple of minutes.

    c. Ensure that each RF-IOM moves to the “RF-IOMs” category in the hierarchical display. Depending on the number of devices on the network, this may take a couple of minutes.
22. Add all routers and RF-IOMs to the map display by drag-and-drop. Note that if a device is shown in blue in the hierarchical display, it has NOT been added to the map display. This is a quick way to see which have yet to be added to the map display. Ensure all are shown as on-line. Note that the radio network links are displayed on the map display. Ensure all links are depicted in green (good link quality) and note the LQIs (see page 45).
    a. If any routers or RF-IOMs don’t show as on-line or are not in the “Router” or “RF-IOMs” categories in the hierarchical display, check that the PCB fuse is intact (0Ω on a multimeter) and that the correct power supply is present.
    b. If any router’s or RF-IOM’s link is shown in red, check for obstructions between it and its parent, check to see that the aerial is fitted and is vertical.
23. In the hierarchical display, right-click on each router and RF-IOM and select “Refresh Node Information” from the menu. This will cause the router or RF-IOM to transmit not only its measurements, but also all its configuration data as well. **NB** - This extra data is NOT normally transmitted, but must be requested using CMS. Where hours run is shown in *italics*, this denotes that a request for data has been sent to a device, but the device has not yet responded.
24. Referencing the site survey plans, switch on all the EDs by fitting the power jumper and remount into the housing (for space housing devices).
    a. If this is the first time the ED has been switched on (or after replacing an EDs battery), hold down the reset button on the ED’s PCB while powering up by fitting the power jumper. This resets the battery hours run to 0.
25. Using CMS, ensure that all the EDs appear in the hierarchical display.
    a. Note that initially, the EDs will be shown in the “Unknown” category in the hierarchical display. This is normal.
    b. Ensure that each ED moves to the “Sensor” category in the hierarchical display. Depending on the number of devices on the network, this may take several minutes.
26. When all EDs have joined the network - *even if still shown in the “Unknown” category* - use CMS to disable auto-commissioning mode. **NB** - this is very important, as trying to change configuration properties while in auto-commissioning mode may cause network errors.
27. Add all EDs to the map display by drag-and-drop. Note that if a device is shown in blue in the hierarchical display, it has NOT been added to the map display. This is a quick way to see which have yet to be added to the map display. Ensure all are shown as on-line. Note that the radio network links are displayed on the map display. Ensure all links are depicted in green and note the LQIs.
    a. If any EDs don’t show as on-line or are not in the “Sensor” category in the hierarchical display, check that the correct battery is fitted, observing polarity.
    b. If any EDs link is shown in red, check for obstructions between it and its parent, check to see that the aerial is fitted and is vertical (for plant housing EDs) or that the housing is mounted correctly (for space housing EDs).
28. In the hierarchical display, right-click on each ED and select “Refresh Node Information” from the menu. This will cause the ED to transmit not only its measurements, but also its hours run and battery hours run data as well. **NB** - This extra data is NOT normally transmitted, but must be requested using CMS. Where hours run and battery level are shown in *italics*, this denotes that a request for data has been sent to a device, but the device has not yet responded.
29. When the installed network is finally formed, briefly press the receiver reset button and ensure the network reforms properly. This may take several minutes, depending on the number of network devices.
30. When the network topology has been verified and all devices are working correctly, user configuration can begin (see pages 36 - 39).
31. Map all receiver analogue outputs needed to the required device measurements (see page 33).
32. When configuration is complete, save the map display layout (see page 49).
33. Generate a report of the completed network to document it for future reference (see page 50).

Best Practise Points:

1. Always conduct a site survey, and ensure that if you plan to use an external extension aerial on the system receiver (for example, if the receiver is to be in a metal panel), you use the same external extension aerial on the SSK receiver for the survey. Document the survey thoroughly, and leave a copy on site.
2. When planning where routers and RF-IOMs are going to be needed, plan for "redundancy", i.e. what happens to all the EDs connected to a router if the router fails? Backup routers are worth considering. See pages 14 - 15.
3. Don't switch on EDs until they're ready to be commissioned. If they're powered on without a parent in range, they will eventually sleep to preserve battery life, only "waking" occasionally to scan for a parent. This may slow commissioning down. If an ED has been powered up for more than 20 minutes without a parent, power-cycle it. ***Pressing the reset button on an ED DOESN'T reset the ED, it only resets the battery hours run time***.
4. Generally speaking, wireless works best in a horizontal plane, so expect reduced signal strength if he receiver is on a different floor to the routers/RF-IOMs/EDs. A good rule of thumb is have the receiver on the same floor as its children, though this isn't always the case.
5. 2.4GHz wireless signals don't go through metal! Plan to circumvent metal obstructions where possible.
6. If the installation environment is one where obstructions are likely to change regularly (in a warehouse, for example!), try to conduct the site survey under a "worst-case" scenario - i.e. assume that at some point, there's going to be an obstruction between the ED/router/RF-IOM and its parent at some time. Simulate it, if possible.
7. When commissioning the installed system, turn the receiver on first, then all the routers and RF-IOMs - starting with "layer" nearest the receiver and working outwards. It's worthwhile checking all the routers are OK in CMS ***before*** finally powering up the EDs.
8. When EDs first join a network, values such as hours run and battery hours run will not be displayed - the values are shown as question marks. This is normal, these values need to be requested from the device (right-click on device and select "Refresh Node Information").
9. Remember that when a receiver scans all 16 channels for the best one, the channel chosen is the best *where the receiver is*. On "long" networks with several "layers" of routers, the channel chosen by the receiver may not always be the quietest at the far end of the network. When the installed network is finally formed, press the receiver reset button and ensure the network reforms properly. This will ensure that, in the event that the receiver needs to change channels (for example), it will work seamlessly.
10. As each network is commissioned, save the layout - even if there isn't a background graphic loaded. This is a good aid to quickly viewing network topology.
11. Document each network! In CMS, right-click on the receiver in the hierarchical display and select "Print Preview" from the menu and print (to paper or a file, such as .PDF) the preview document. This gives a reference to call on at a later date if required.

Trouble-Shooter's Guide

System ED		
Symptom	**Cause**	**Actions**
No connectivity to receiver	ED has not been authorized to the receiver	Manually authorize ED to receiver or use auto-commissioning
	No radio connection	Check aerial on receiver
	Receiver not switched on	Switch receiver on
	ED not switched on	Switch ED on
	Incorrect battery polarity	Check battery polarity
	Flat ED battery	Change ED battery
	After switching on, if an ED cannot join a network after about 20 minutes, it will go into "sleep" mode to preserve battery life, only waking occasionally	Power-cycle the ED (switch it OFF and back ON) after ensuring all routers and the receiver are powered, and the routers have successfully joined the network
ED appears in "Unknown" category in CMS when commissioning	ED has joined network but has yet to pass configuration data to the receiver	None - normal operation
ED stays in "Unknown" category in CMS when commissioning for more than 30 minutes	ED hardware error	Check ED options fitted (SP pot, thermistor, RH&T element)
In CMS, ED doesn't show hours run, firmware version, battery hours run or last update time	Normal. To help preserve battery life, an ED doesn't send this information unless it is requested	Request information using the "Refresh Node Information" method
ED connects directly to the receiver, even though there's a router between them	Normal. An ED will ***ALWAYS*** join a network using the least number of "hops" to the receiver.	None - normal operation. The ED will re-join the network *via* the router if it loses its direct path to the receiver
Only 12 EDs connect directly to my receiver	Normal. The maximum number of directly connected EDs a receiver will allow is 12	If there are more than 12 EDs, at least one router must be used
Only 8 EDs connect directly to my router	Normal. The maximum number of directly connected EDs a router will allow is 8	If there are more than 8 EDs, at least one additional router must be added
I replaced the battery in my ED, but the battery hours run doesn't show as having been reset in CMS	Normal. Updated ED information hasn't been requested	Request information using the "Refresh Node Information" method
	The battery hours run reset procedure wasn't carried out when the battery was replaced	Power OFF the ED, press and hold the PCB button near the battery WHILE powering the ED ON
My ED was switched on in error before the receiver and routers, but hasn't joined the network	After switching on, if an ED cannot join a network after about 20 minutes, it will go into "sleep" mode to preserve battery life, only waking occasionally	Power-cycle the ED (switch it OFF and back ON) after ensuring all routers and the receiver are powered, and the routers have successfully joined the network

System Router		
Symptom	**Cause**	**Actions**
No connectivity to receiver	Router has not been authorized to the receiver	Manually authorize router to receiver or use auto-commissioning
	No radio connection	Check aerial on receiver
		Check aerial on router
	Receiver not switched on	Switch receiver on
	Router not switched on	Switch router on
	Incorrect supply polarity	Check supply polarity
	Router fuse	Check router fuse is OK, replace if necessary
Router appears in "Unknown" category in CMS when commissioning	Router has joined network but has yet to pass configuration data to the receiver	None - normal operation
Router stays in "Unknown" category in CMS when commissioning for more than 3 minutes	Router hardware error	Check router options fitted (thermistor, RH&T element)
Router connects directly to the receiver, even though there's a router between them	Normal. An router will ALWAYS join a network using the least number of "hops" to the receiver.	None - normal operation. The router will re-join the network via the other router if it loses its direct path to the receiver
Only 4 routers connect directly to my receiver	Normal. The maximum number of directly connected routers a receiver will allow is 4, **if there are 12 directly connected EDs**	None - normal operation
Only 8 routers connect directly to my router	Normal. The maximum number of directly connected routers a router will allow is 8 **if there are 8 directly connected EDs**	None - normal operation

RF-IOM		
Symptom	**Cause**	**Actions**
No connectivity to receiver	RF-IOM has not been authorized to the receiver	Manually authorize RF-IOM to receiver or use auto-commissioning
	No radio connection	Check aerial on receiver
		Check aerial on RF-IOM
	Receiver not switched on	Switch receiver on
	RF-IOM not switched on	Switch RF-IOM on
	Incorrect supply polarity	Check supply polarity
	RF-IOM fuse	Check RF-IOM fuse is OK, replace if necessary
RF-IOM appears in "Unknown" category in CMS when commissioning	RF-IOM has joined network but has yet to pass configuration data to the receiver	None - normal operation
RF-IOM stays in "Unknown" category in CMS when commissioning for more than 3 minutes	RF-IOM hardware error	Check RF-IOM
RF-IOM connects directly to the receiver, even though there's a RF-IOM between them	Normal. An RF-IOM will ALWAYS join a network using the least number of "hops" to the receiver.	None - normal operation. The RF-IOM will re-join the network via the other RF-IOM or router if it loses its direct path to the receiver
Only 4 RF-IOMs connect directly to my receiver	Normal. The maximum number of directly connected RF-IOMs a receiver will allow is 4, if there are 12 directly connected EDs	At least one more RF-IOM or router must be added
Only 8 RF-IOMs connect directly to my router	Normal. The maximum number of directly connected RF-IOMs a RF-IOM or router will allow is 8 if there are 8 directly connected EDs	At least one more RF-IOM or router must be added
Input LED flashing	Normal. This denotes that the input has been set up and a VFC digital input, but is in the OFF state.	None - normal operation
Input LED ON	Normal. This denotes that the input has been set up and a VFC digital input, but is in the ON state.	None - normal operation
Input type changed but the change is not shown in CMS	RF-IOM not reset after change has been made.	Press the reset button on the RF-IOM

System Receiver		
Symptom	**Cause**	**Actions**
LED D603 flashing once per second	The receiver has found no children on the network	Check aerial and extension co-ax (if fitted)
		If commissioning a network, ensure the receiver is in auto-commissioning mode, or manually authorize new devices
		Ensure network devices are switched on and in range
LED D603 on receiver not lit at all	No power to receiver	Check power to receiver
	Receiver not switched on	Switch on receiver
	Receiver fuse	Check power supply polarity if using a DC supply
		Check receiver fuse is OK, replace if necessary
No analogue output voltages	Output(s) not mapped	Map analogue outputs with CMS
LED D604 flashing occasionally	Reception of network data	None - normal operation

CMS		
Symptom	**Cause**	**Actions**
CMS doesn't start	No receiver connected to PC	Connect receiver to PC using USB cable
	Receiver not switched on	Switch on receiver
	Drivers not installed	Install drivers
	Another instance of CMS is already running on the PC	Only one instance of CMS can run at a time
Some menu items are greyed out	Not logged in as admin	Log in at admin level
	Admin level timed out	Log in at admin level
	Auto-commissioning mode is enabled.	Disable auto-commissioning mode
Map display not visible	Graphical display not selected	Select graphical display
Text display not visible	Text display not selected	Select text display
Device in Sensor tree is shown in blue	Device not on map display	Drag-and-drop onto map display
Device in Router tree is shown in blue	Device not on map display	Drag-and-drop onto map display
Links in map display are not in colour	Not logged in as admin	Log in at admin level
When reconnecting to a receiver, device values don't appear immediately	Normal	Wait for devices to report latest values to the receiver
When first commissioned, ED parameter values such as hours run are shown as "?"	Normal	Request extra information using the "Refresh Node Information" method
After changing a battery, an EDs battery hours run value hasn't changed	Normal	Request extra information using the "Refresh Node Information" method
When I request node information, the data doesn't come back immediately	Normal - an ED will only send this data the next time it wakes	Wait for devices to report latest values to the receiver
Device didn't accept label change and turned red in the map display	Tried to change label while in auto-commissioning mode	Disable auto-commissioning mode. Wait for device to return to normal, or power cycle
Device didn't accept transmit time change	Tried to change label while in auto-commissioning mode	Disable auto-commissioning mode. Wait for device to return to normal, or power cycle

System Receiver RF-RXS-N		
Symptom	**Cause**	**Actions**
Network LED flashing once per second	The receiver has found no children on the network	Check aerial and extension co-ax (if fitted)
		If commissioning a network, ensure the receiver is in auto-commissioning mode, or manually authorize new devices
		Ensure network devices are switched on and in range
LEDs on receiver not lit at all	No power to receiver	Check power to JACE
No communications	SonNet driver configured for wrong JACE slot	Configure SonNet driver for correct slot (see page 51)
Data LED flashing occasionally	Reception of network data	None - normal operation

System Receiver RF-RXS		
Symptom	**Cause**	**Actions**
Network LED flashing once per second	The receiver has found no children on the network	Check aerial and extension co-ax (if fitted)
		If commissioning a network, ensure the receiver is in auto-commissioning mode, or manually authorize new devices
		Ensure network devices are switched on and in range
LEDs on receiver not lit at all	No power to receiver	Check power to receiver
	Receiver not switched on	Switch on receiver
	Receiver fuse	Check power supply polarity if using a DC supply
		Check receiver fuse is OK, replace if necessary
No communications via RS-232 port	USB port connected to PC	Disconnect USB
Data LED flashing occasionally	Reception of network data	None - normal operation

Estimating Network Coverage in the Absence of a Site Survey

The theoretical transmission distance that can be achieved between two wireless devices can be calculated from a few "key" parameters;

- *Transmission power of device*. This is the wireless device's transmission power and is typically measured in dBm. With greater transmission power, greater distances can be achieved.

- *Receiver sensitivity of device*. This is the wireless device's receiver sensitivity and is typically measured in dBm. With greater receiver sensitivity, the device is able to receive weaker signals, which means greater distances can be supported

- *Antenna gain*. The gain for an antenna is typically measured in dBi and basically indicates how much the signal is boosted by the antenna.

- *Frequency*. The frequency is typically measured in MHz or GHz and indicates which electromagnetic band is used for wireless communication.

The formula for calculating the theoretical transmission distance is based on the Friis Transmission Equation for ***free space loss***. The Friis Transmission Equation can be modified to give range, as follows:

$$r = \frac{10^{(Pt + Gt + Gr - Pr)/20}}{41.88 * f}$$

where:

r = range in km
Pt = Transmit power (dBm)
Pr = receiver gain (dBm)
Gt = transmitter aerial gain (dBi)
Gr = receiver aerial gain (dBi)
f = frequency (MHz)

SonNet Routers, RF-IOMs and Receivers	
Frequency	2400 MHz
Tx power	10 dBm
Tx antenna gain	3 dBi
Rx antenna gain	3 dBi
Rx sensitivity	-102 dBm
Theoretical Range (km)	7.9km

SonNet End Devices	
Frequency	2400 MHz
Tx power	0 dBm
Tx antenna gain	1.2 dBi
Rx antenna gain	1.2 dBi
Rx sensitivity	-96 dBm
Theoretical Range (km)	0.8km

Note that this gives the *theoretical transmission distance that can be achieved*. Certainly, there are likely to be significant differences between the theoretical transmission distance and the actual results in the field, as these calculations are based on an unobstructed line-of-sight signal with no electronic interference.

However, the real world presents many variables that result in less “ideal” wireless performance, such as building obstructions and reflected signals.

Therefore, it is always preferable to conduct a thorough site survey in order to determine what is actually happening to the wireless signals in the field. Before conducting a site survey, however, it may be helpful to evaluate the different options available for the wireless hardware. The formula provides a straightforward way to perform this evaluation and whether the desired transmission distance it can be achieved and so make an informed decision when selecting SonNet devices for different wireless applications.

Attenuation Properties of Common Building Materials

Building Material	**2.4 GHz Attenuation**
Solid Wood Door 4.5cm	6 dB
Hollow Wood Door 4.5cm	4 dB
Interior Office Door w/Window 4.5cm /1.3cm	4 dB
Steel Fire/Exit Door 4.5cm	13 dB
Steel Fire/Exit Door 6.4cm	19 dB
Steel Rollup Door 3.8cm	11 dB
Brick 8.9cm	6 dB
Concrete Wall 45.7cm	18 dB
Cubical Wall (Fabric) 5.7m	18 dB
Exterior Concrete Wall 6.4cm	53 dB
Glass Divider 1.3cm	12 dB
Interior Hollow Wall 10.2cm	5 dB
Interior Hollow Wall 15.2cm	9 dB
Interior Solid Wall 12.7cm	14 dB
Marble 5.1cm	6 dB
Bullet-Proof Glass 2.5cm	10 dB
Exterior Double Pane Coated Glass 2.5cm	13 dB
Exterior Single Pane Window 1.3cm	7 dB
Interior Office Window 2.5cm	3 dB
Safety Glass-Wire 0.6cm	3 dB
Safety Glass-Wire 2.5cm	13 dB

Strategy Tips

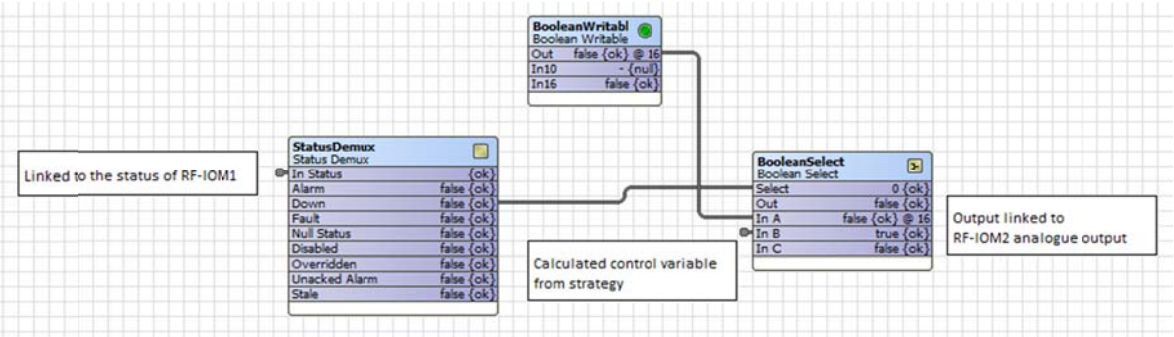
1. When using wireless devices to control critical plant, it is always advisable to add strategy safeguards that can take protective action in the event a wireless device loses communications with its parent receiver.

An example of this is where an RF-IOM analogue output is used to switch on an electric heater battery. One of the key interlocking safety features would be to ensure that the supply fan is running before allowing the heater to be powered on.

In this example, the fan status (taken from, for example, a Sontay PA-930 air DP switch or PM-CSX current switch) is connected to a VFC input on RF-IOM1 and the output from RF-IOM2 is used to driver the heater battery.

If RF-IOM1 goes offline, the control strategy and RF-IOM2 no longer knows if the fan is running, so it is potentially unsafe to switch the heater battery on.

The simple Niagara Workbench strategy below monitors the status of RF-IOM1, and if it goes into a "Down" state (i.e. it goes offline), it will cause the BooleanSelect to output the value held in the BooleanWritable module (FALSE in this case), rather than the normal control status derives from strategy.

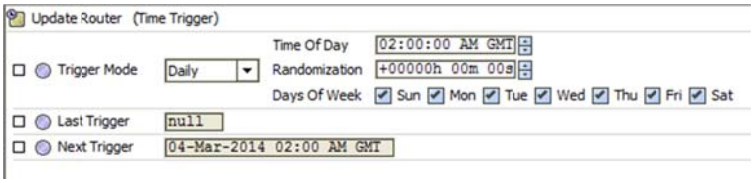


Note that in the event that RF-IOM2 goes offline, the output controlling the heater can be configured to go a 0V using the appropriate fall-back value setting.

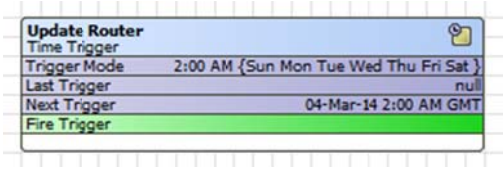
This ensures that the heater battery will be switched off if either of the RF-IOMs goes offline.

2. It should be remembered that only measured values from an ED, router or RF-IOM are normally sent, whether by transmission time or significant change of value.

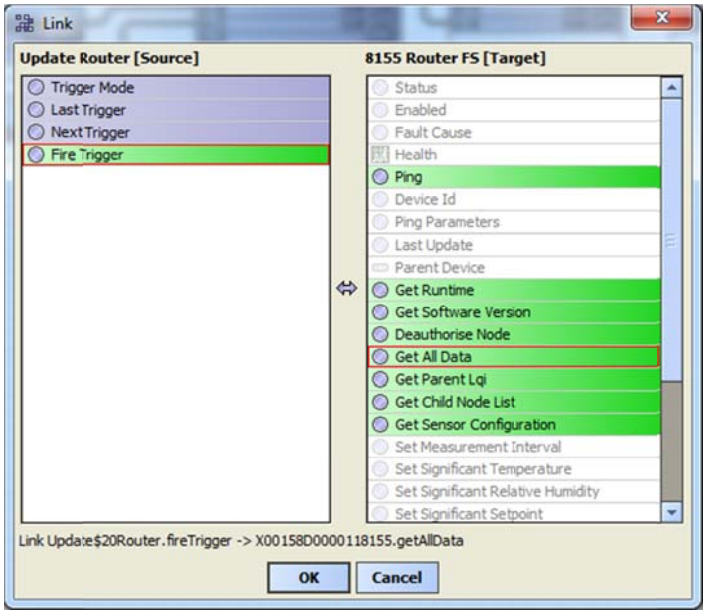
Therefore, other parameters, such as battery runtime, parent LQI and device runtime, are NOT sent unless requested. As simple strategy to request this information on a timed interval basis can be achieved.


Update Router (Time Trigger)
Trigger Mode
Daily
Time Of Day 02:00:00 AM GMT
Randomization +00000h 00m 00s
Days Of Week Sun Mon Tue Wed Thu Fri Sat
Last Trigger null
Next Trigger 04-Mar-2014 02:00 AM GMT

Add a "Daily Trigger" to the wiresheet, and set its parameters to a time of day (probably at night, when there's least activity).


Update Router
Time Trigger
Trigger Mode 2:00 AM {Sun Mon Tue Wed Thu Fri Sat}
Last Trigger null
Next Trigger 04-Mar-14 2:00 AM GMT
Fire Trigger

Right-click on the trigger, select <Link Mark> from the menu, and then right-click on the SonNet device to be updated and select <Link from "trigger name">.



Select <Fire Trigger> on the trigger side and "Get All Data" on the SonNet device side. Other options are to select <Get Runtime> or <Get Parent Lqi>, if these are specifically what is required to be updated. Click the <OK> button.

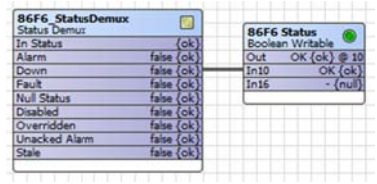
Specific updates are preferable to <Get All Data>, as less network traffic is generated and consumes less battery power in EDs.

Now, when the trigger module fires, it will cause a "Get All Data" command to be sent to the SonNet device.

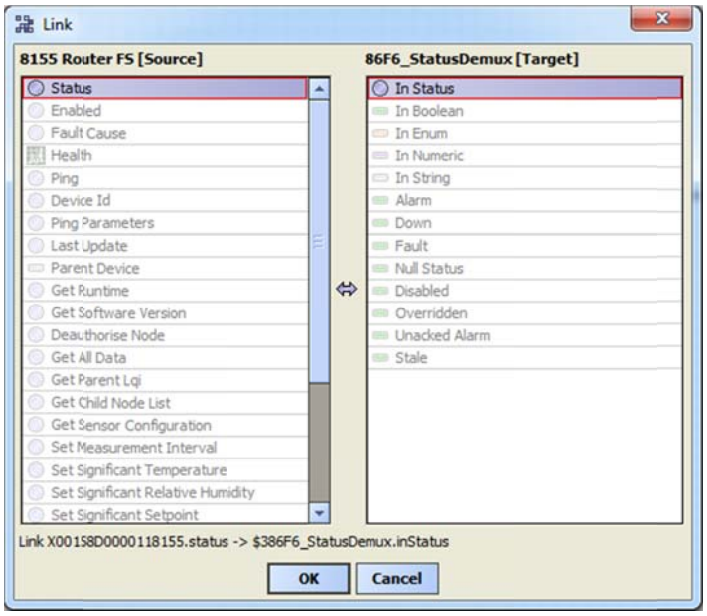
NB If several SonNet devices are to be updated this way, it is strongly recommended that the update times are staggered by at least 15 minutes, to avoid heavy network traffic.

3. Strategy can be used to on a wiresheet to show the status of a SonNet device.

Add a StatusDemux module to the wiresheet, with a Boolean Writable. Link the <Down> slot to an input of the Boolean Writable.



Right-click on a SonNet device, select <Link Mark> from the menu.



Right-click on the StatusDemux module and select <Link from "device name"> and select <Status> on the device side and "In Status" on the StatusDemux module side. Click the <OK> button.

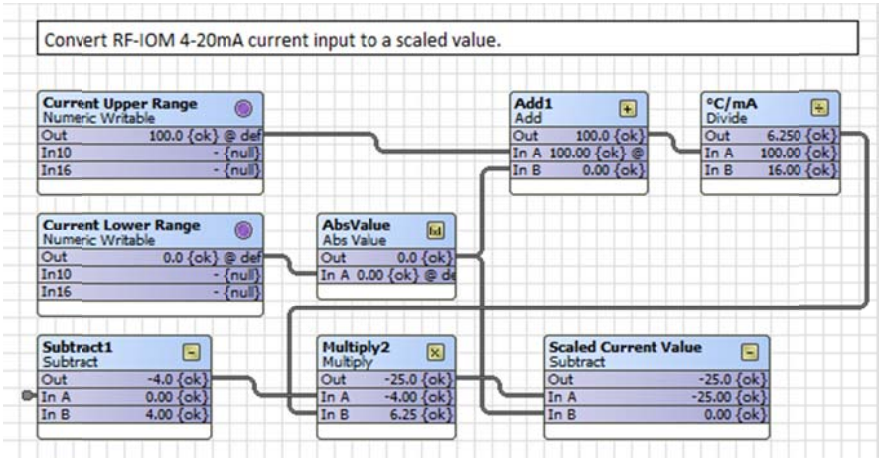
If required, the facets of the Boolean Writable can be changed to "OFFLINE" for a True status, and ONLINE for a False status.

A <BooleanChangeOfStateAlarmExt> can be added to the Boolean Writable for alarming purposes.

4. Scaling a 4-20mA RF-IOM Input

Two Numeric Writables are used to set the upper and lower ranges (for example, the upper could be 40°C and the lower 0°C, for a temperature sensor, or the upper could be 500Pa and the lower 0°C, for a pressure sensor). The example below uses an upper of 100 and a lower of 0, typical for an RH sensor.

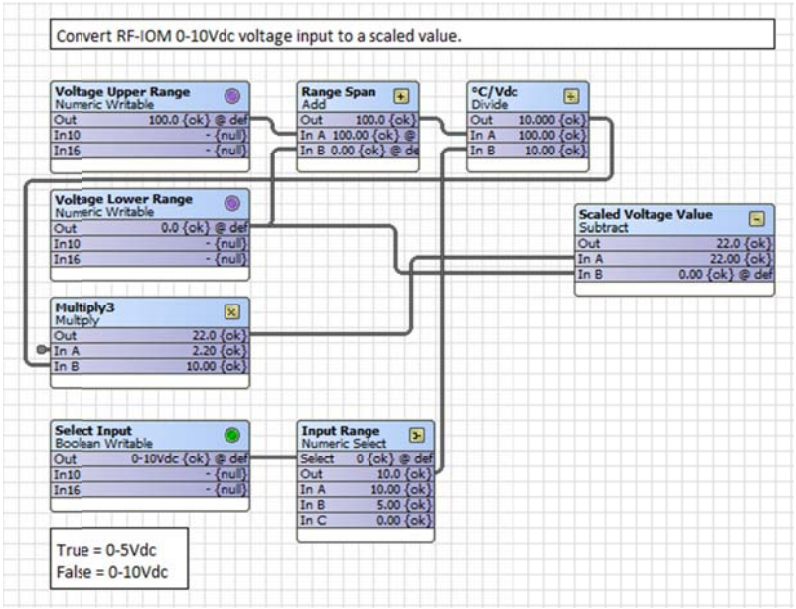
The input value from the RF-IOM is linked to InA slot of the Subtract1 module, and the scaled output is available from the Out slot of the Scaled Current Value module.



5. Scaling a voltage RF-IOM Input

Two Numeric Writables are used to set the upper and lower ranges (for example, the upper could be 40°C and the lower 0°C, for a temperature sensor, or the upper could be 500Pa and the lower 0°C, for a pressure sensor). The example below uses an upper of 100 and a lower of 0, typical for an RH sensor.

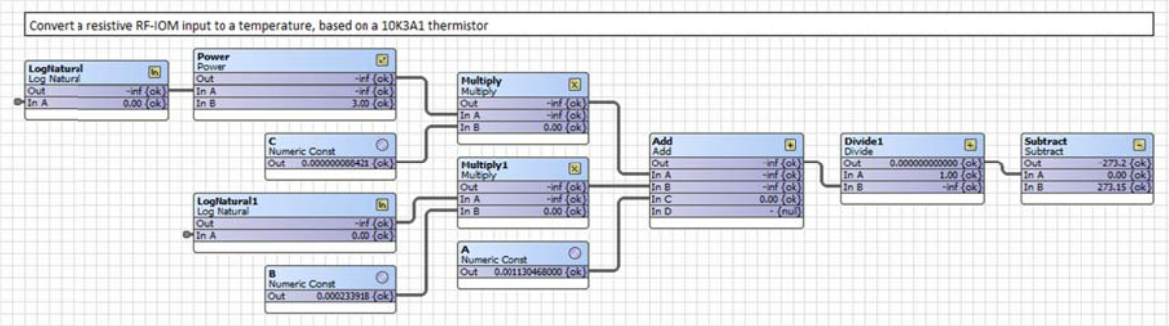
The input value from the RF-IOM is linked to InA slot of the Multiply3 module, and the scaled output is available from the Out slot of the Scaled Voltage Value module.



A Boolean Writable can be used to offer scaling for either 0-5Vdc or 0-10Vdc inputs.

6. Scaling a Resistive RF-IOM Input for a 10K3A1 Thermistor

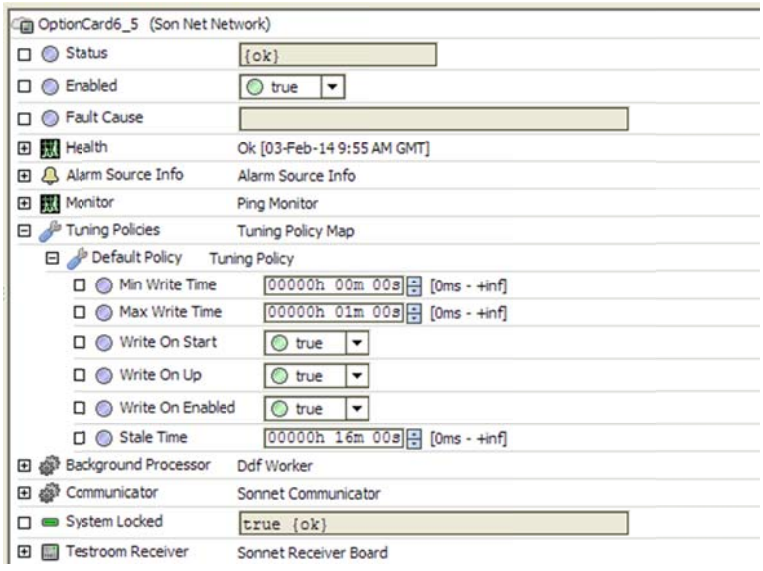
As a rule, for greatest accuracy, the precision of the module facets should be set to 12. The 3 coefficients, A, B and C are specific to a 10K3A1 thermistor, but others could be used, according to the Steinhart-Hart method. The final Subtract module can be omitted if °K is required, rather than °C.



7. Stale Values

It will be noticed that some points shown in the receiver, router and ED property sheets are suffixed {stale}. This is because the driver looks for values to be updated with a configurable time. If any values aren't updated within this time they are marked as stale.
It is important to remember that, under normal conditions, *only measured values* are sent by devices (routers or EDs). Configuration parameters and other data are not sent *unless requested*, and will therefore eventually be marked as stale.
A devices *measured values* will be marked as stale if they are not updated within the response timeout period. Typically, an ED has its default transmission time set to 900 seconds, so if the response time is set to 1 minute (for example), the measured values will be marked as stale.
To ensure this doesn't happen, it is strongly recommended that the receiver response timeout is set accordingly;

- Right-click on the <SonNetNetwork> folder in the <Station\Config\Drivers> navigation tree, then select <Views> then <Property Sheet>
- Expand the <Tuning Policies> section, then expand the <Default Policy> section.

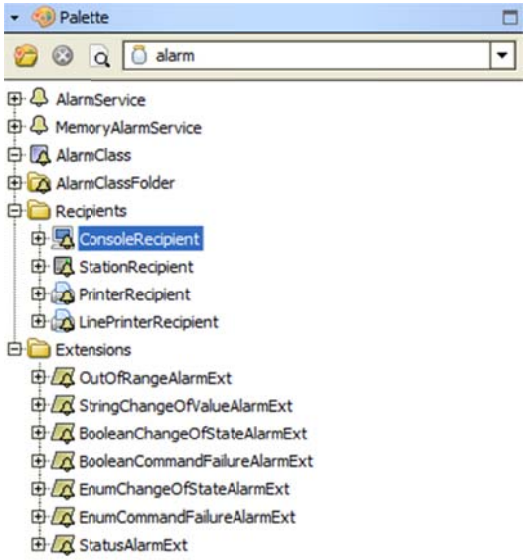

OptionCard6_5 (Son Net Network)
Status {ok}
Enabled true
Fault Cause
Health Ok [03-Feb-14 9:55 AM GMT]
Alarm Source Info Alarm Source Info
Monitor Ping Monitor
Tuning Policies Tuning Policy Map
Default Policy Tuning Policy
Min Write Time 00000h 00m 00s [0ms - +inf]
Max Write Time 00000h 01m 00s [0ms - +inf]
Write On Start true
Write On Up true
Write On Enabled true
Stale Time 00000h 16m 00s [0ms - +inf]
Background Processor Ddf Worker
Communicator Sonnet Communicator
System Locked true {ok}
Testroom Receiver Sonnet Receiver Board

- Set the <Stale Time> to 16 minutes (or a value that reflects longest time a device may require to pass information to the driver, which may be affected not only by its default transmission time but by how many routers it may need to pass its measurement data through to get to the receiver.

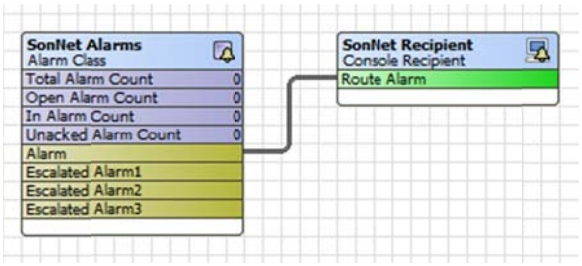
Alarms

Alarms can be set up using the <Alarm> palette.

- Open the <Alarm> palette and drag a new <Alarm Class> onto the Alarm Service wiresheet. Call it “SonNet Alarms”.



- Drag a new <ConsoleRecipient> onto the wiresheet and link it to the SonNet alarm class.



- Next, drag alarm extensions from the alarm palette onto points which require alarm monitoring. In the alarm extensions property sheet, set the alarm class to SonNet Alarms.